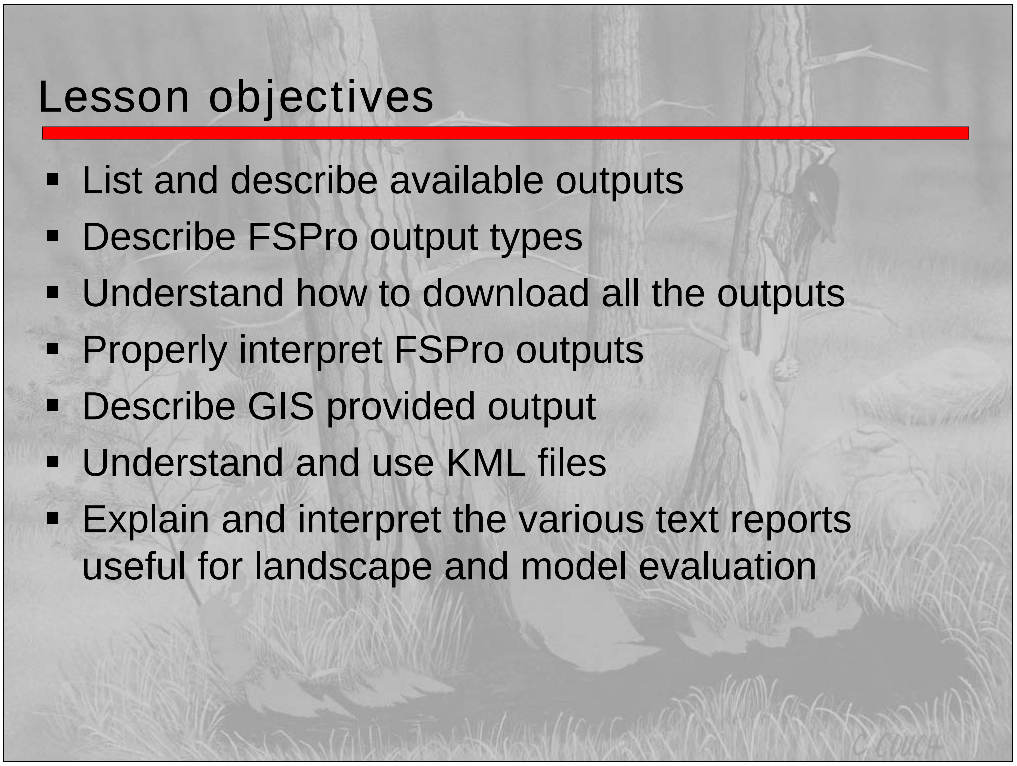
In this lesson, we will be covering the outputs available from an FSPro simulation. By the end of this lesson, you should have a good understanding of the available outputs, how to acquire and view them, as well as interpret them. This lesson should take approximately one and a half hours to complete.

As you work through this lesson, you may find it useful to login to WFDSS and access the same FSPro analysis you used for the Lesson 1 Exercise of this unit. You may find that using the information presented here and following along in WFDSS may facilitate your comprehension and understanding of the material.

It must be stressed that the WFDSS system and its components are still a work in progress; as such, as new updates or changes are applied, the appearance and acquisition of information may be different then presented here. While screen captures of the most current views were used in the development of this lesson, do not be surprised if when you access the system there are subtle changes or differences from the material presented here.



Let’s first go over the lesson objectives. Upon successful completion of this lesson, you should be able to:

1) List and describe available outputs;

2) Describe FSPro output types;

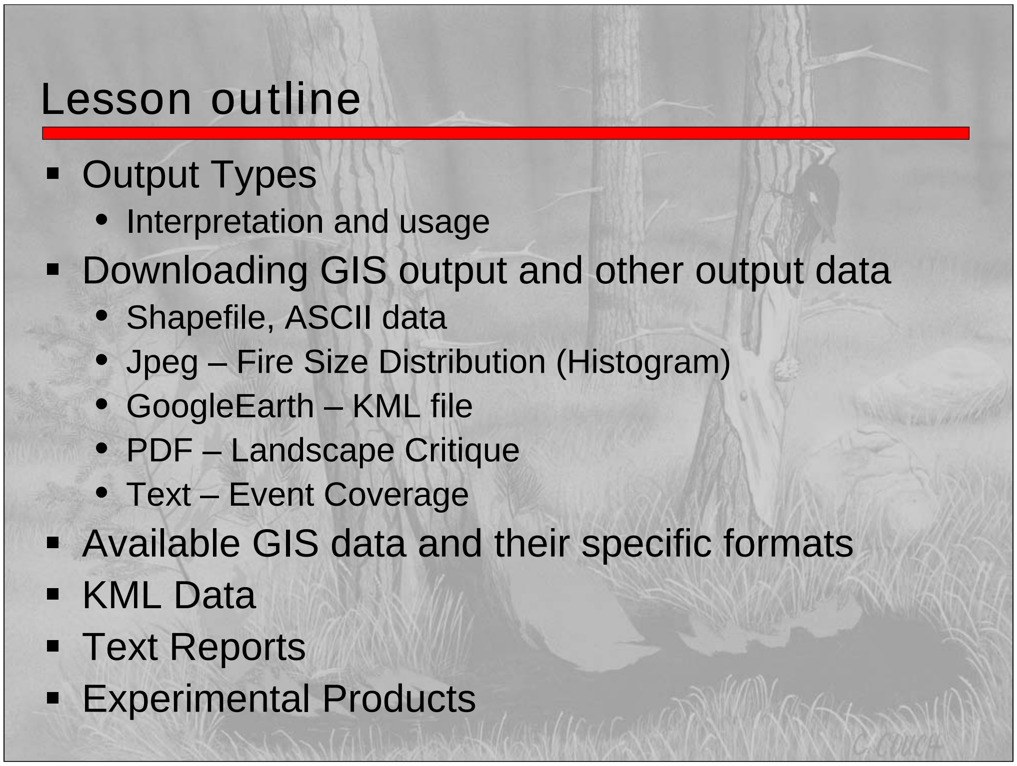
3) Understand how to download all the outputs;

4) Properly interpret FSPro outputs;

5) Describe GIS provided output;

6) Understand and use KML files; and

7) Explain and interpret the various text reports useful for documentation and landscape and model evaluation.



Following are the general sections of this presentation:

1) Output Types, including interpretation and usage;

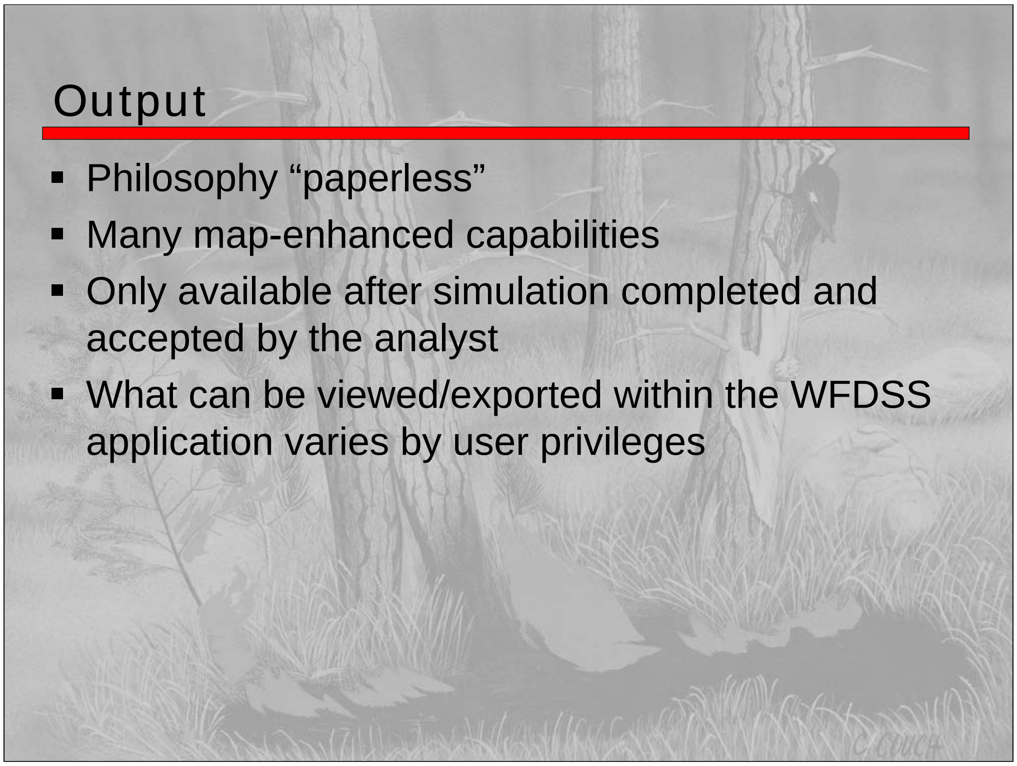
2) Downloading GIS output and other output data, including Shapefiles and ASCII data, Jpegs such as Fire Size Distribution (Histogram), GoogleEarth such as KML files, PDFs such as Landscape Critique, and Text files such as Event Coverage.

3) Available GIS data and their specific formats;

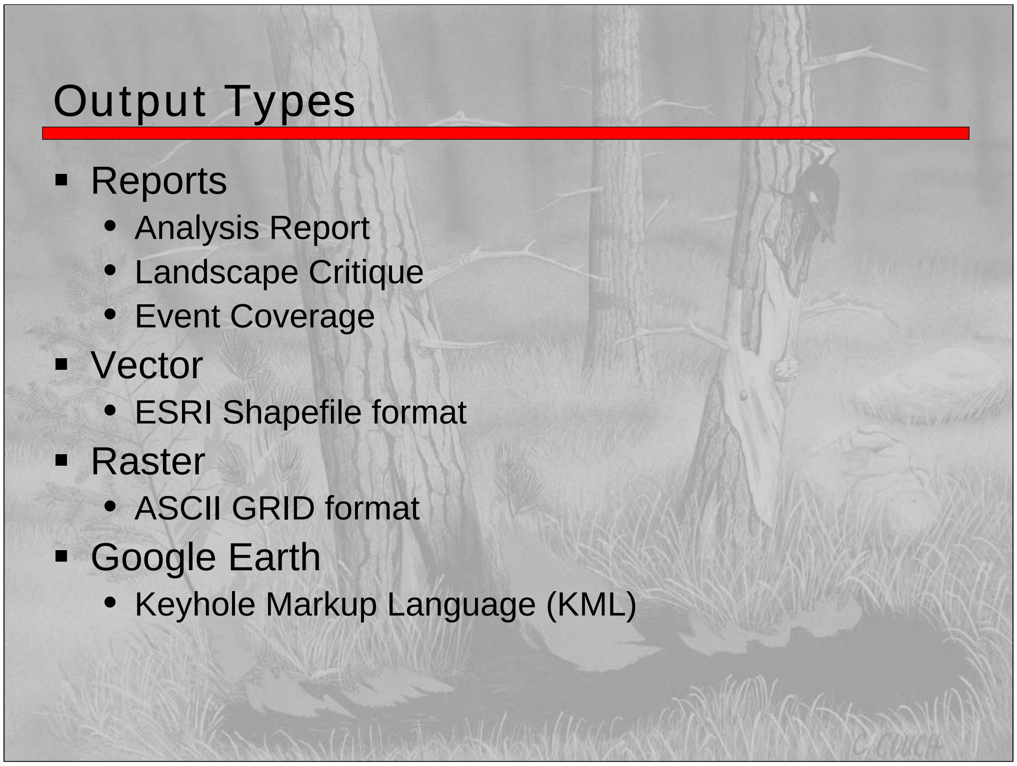
4) KML Data;

5) Text Reports; and finally

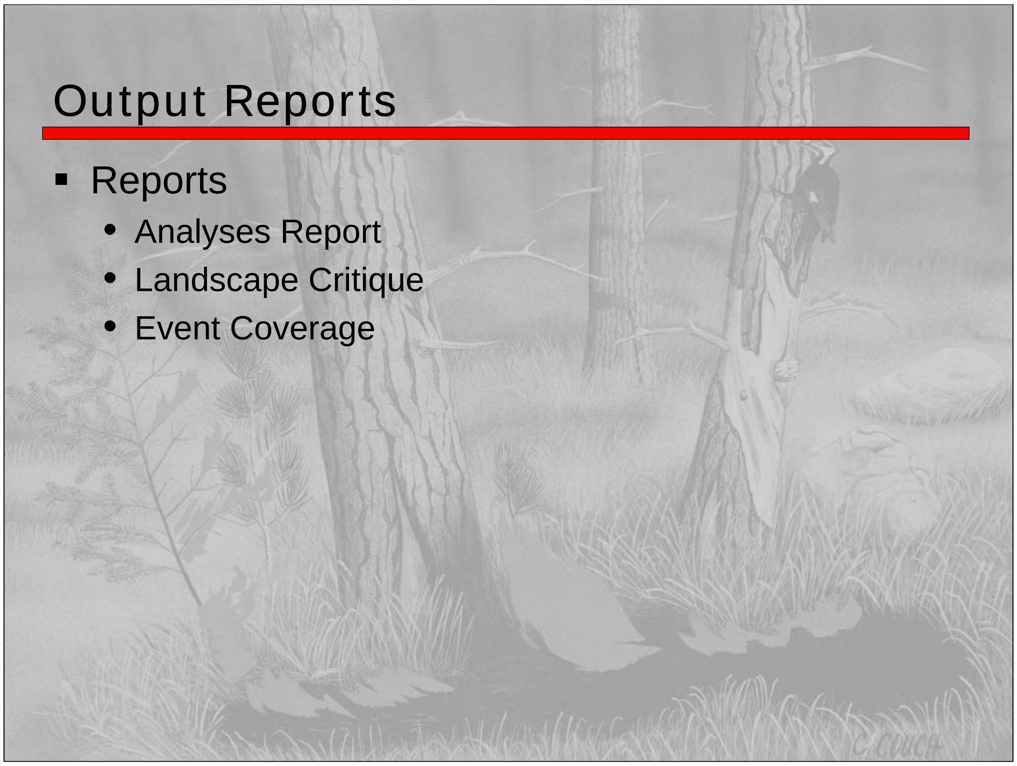
6) Experimental Products.



So let’s get started discussing output types. It is important to remember that the current WFDSS philosophy on outputs has been primarily one of a paperless-mapless environment. For this reason, many map-enhanced viewing capabilities have been incorporated into the WFDSS system for viewing and interpreting FSPro outputs, such as: Google Maps, topographic maps, and the ability to add overlays of ancillary data. A very critical element is that outputs become available to other users of the system only after the FSPro run has been accepted by the analyst. Information available and visible to users varies based on their granted privileges in the WFDSS application.



There are a variety of outputs available from the system. There are three text reports that can be used for documentation purposes and to evaluate the landscape and validity of the run. Two types of GIS compatible output are also available in vector or raster format. The shapefiles and ASCII data can be used within any GIS program; however, they will need to be manipulated within GIS to be properly viewed. A Google Earth KML file is also available for download from the system. This KML file is very useful for sharing with others as all that is required is the freeware version of Google Earth. Its file size is generally small enough to be emailed, and it contains information concerning FSPro inputs and some outputs.



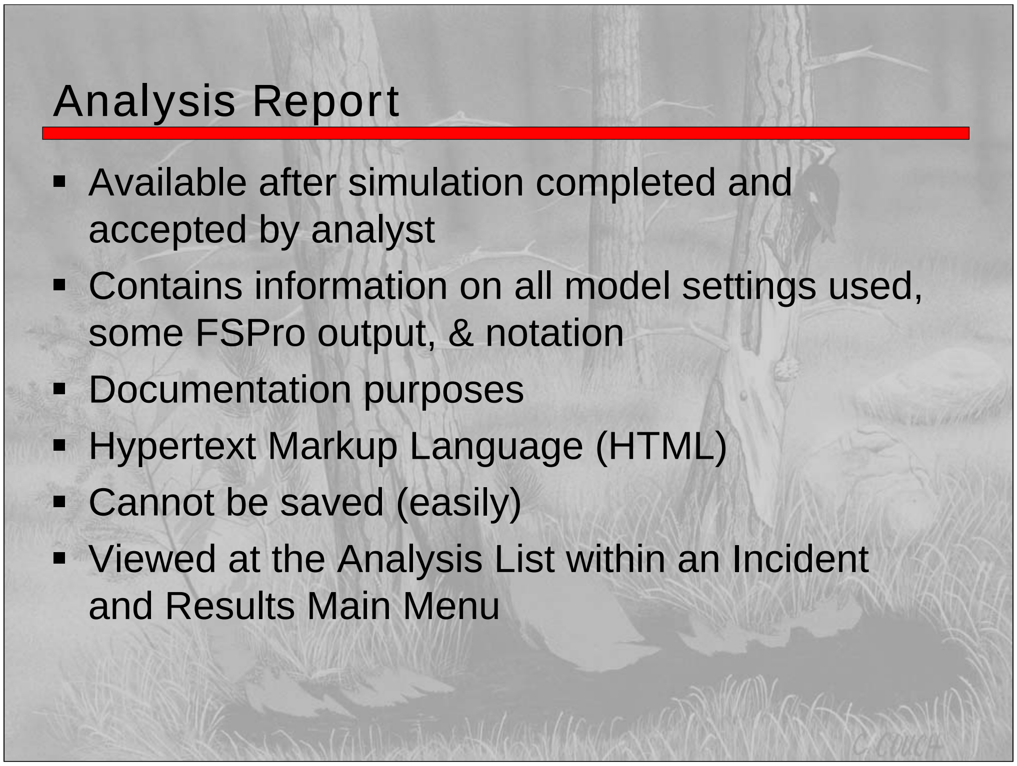
Three text reports are generated containing information about the FSPro analysis. They are all available to the analyst only after the FSPRo simulation has finished. None of the reports are available to other WFDSS users until the FSPro Analysis has been accepted and shows as “Completed” in the WFDSS system.

The Analysis Report is in HTML format and is available interactively to the analyst once the FSPro simulation has finished. It is the only report that does not have to be downloaded first to be viewed.

The Landscape Critique is in PDF format; it, too, is available only once the FSPro simulation has finished. However, to be viewed, it must first be downloaded.

The Event Coverage is in a generic text file format. Like the other reports, it is only available after the FSpro simulation has finished and must be downloaded before it can be viewed.

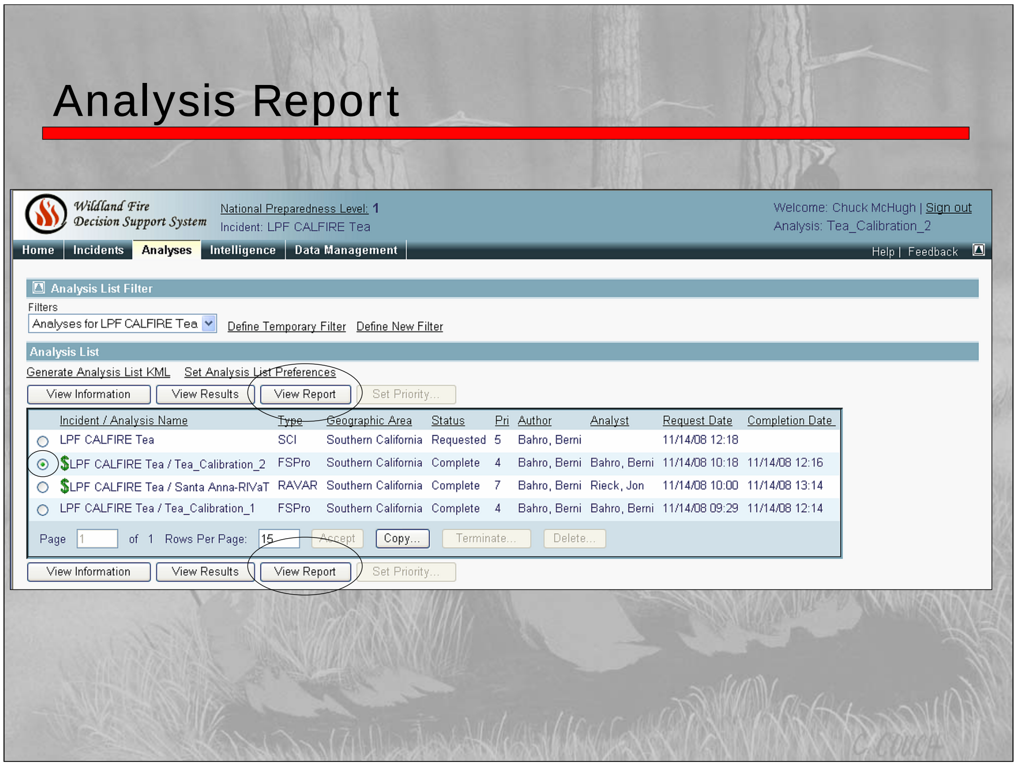
Because the Landscape Critique and Event Coverage reports are accessed so differently, we will focus on the Analysis Report first, discussing the Landscape Critique and Event Coverage reports when we get to the Download section of the lesson.



The Analysis Report is only available after the FSPro simulation has finished. If you are the assigned analyst, you can view the report anytime after the simulation has finished. However, other users of the system (depending on their privileges) will have access to this information only once the FSPro analysis has been "Accepted" by you, the analyst. Until then, it will be unavailable to other users. The Analysis Report contains all information concerning incident information, FSPro model settings and inputs, analysis notes provided by the analyst, and some model output. As you'll recall, this report was discussed in Lesson 1 of this Unit.

The Analysis Report is useful for documentation purposes and for familiarizing yourself with previous analyses for an incident if you assume the analyst duties. The report information and the notation sections are intended to provide pertinent and critical information associated with an analysis. This may prove useful if you have to revisit an analysis at a later date.

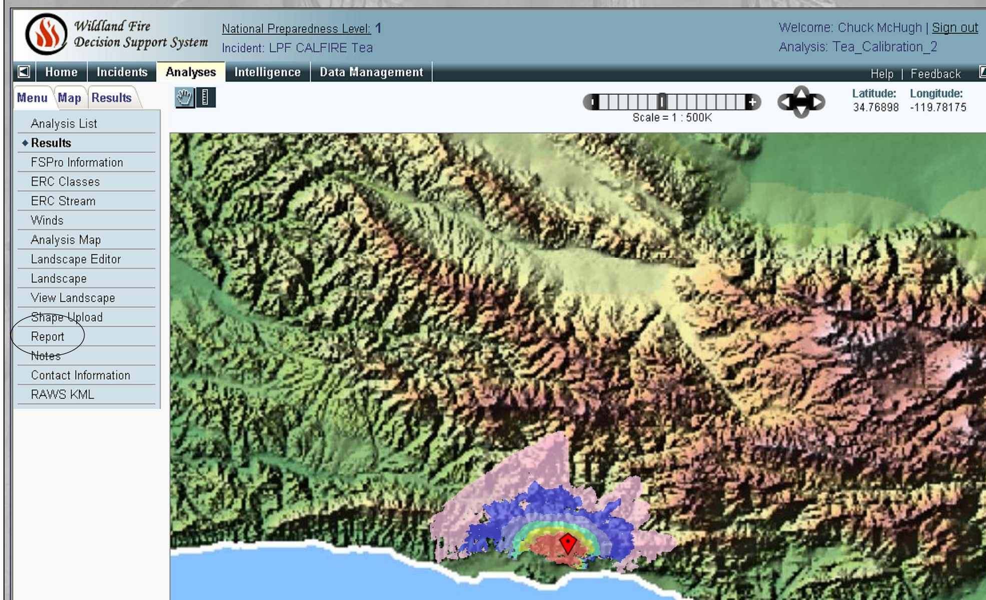
While it can be printed out, saving the report can be difficult since it is in HTML format rather than as a PDF or text document. The report will stay active in the WFDSS system, unless the analysis is deleted. The report can be accessed from the Analysis list within an Incident and from the Results Main Menu for a specific analysis.



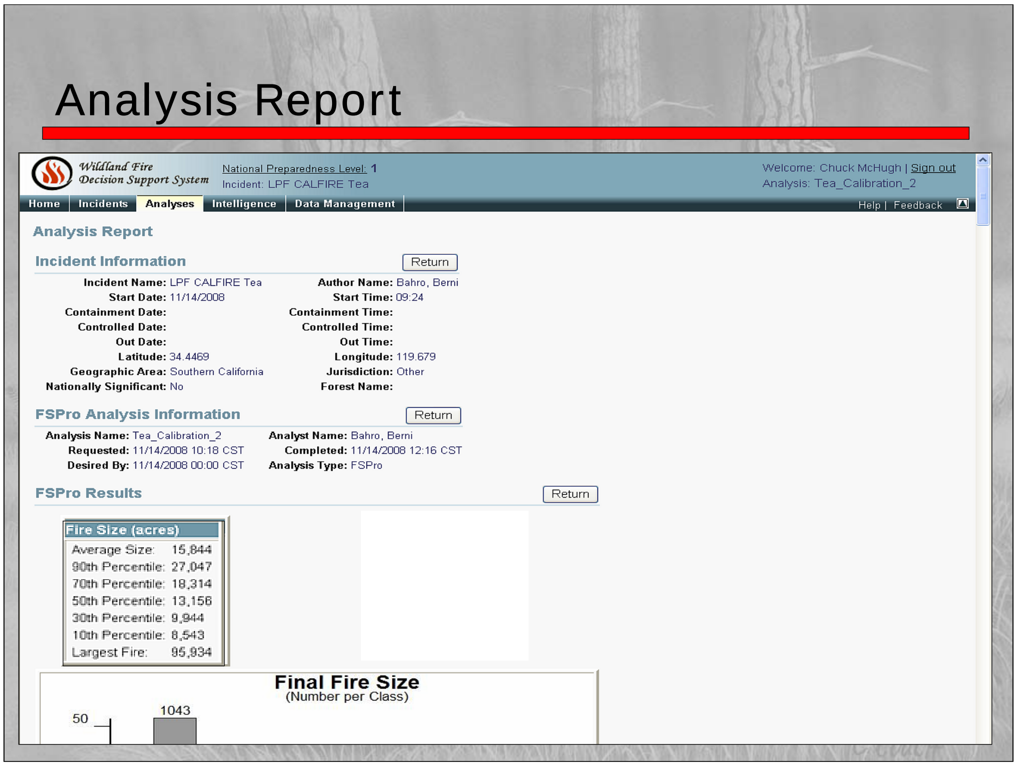
When you first view the analysis list for an Incident, the View Report box will be grayed-out until a specific analysis is selected. An analysis is made active by clicking in the radio button to the left of the Analysis Name. Once an analysis is active, the View Reports box can be selected, which will open a new window with the Analysis Report active.

Because there are numerous Incidents in WFDSS and within any one Incident numerous analyses, do not forget to use the Filters option in WFDSS to limit, select, or view this information. Use of Filters was discussed in Lesson 1 of this unit.

Analysis Report

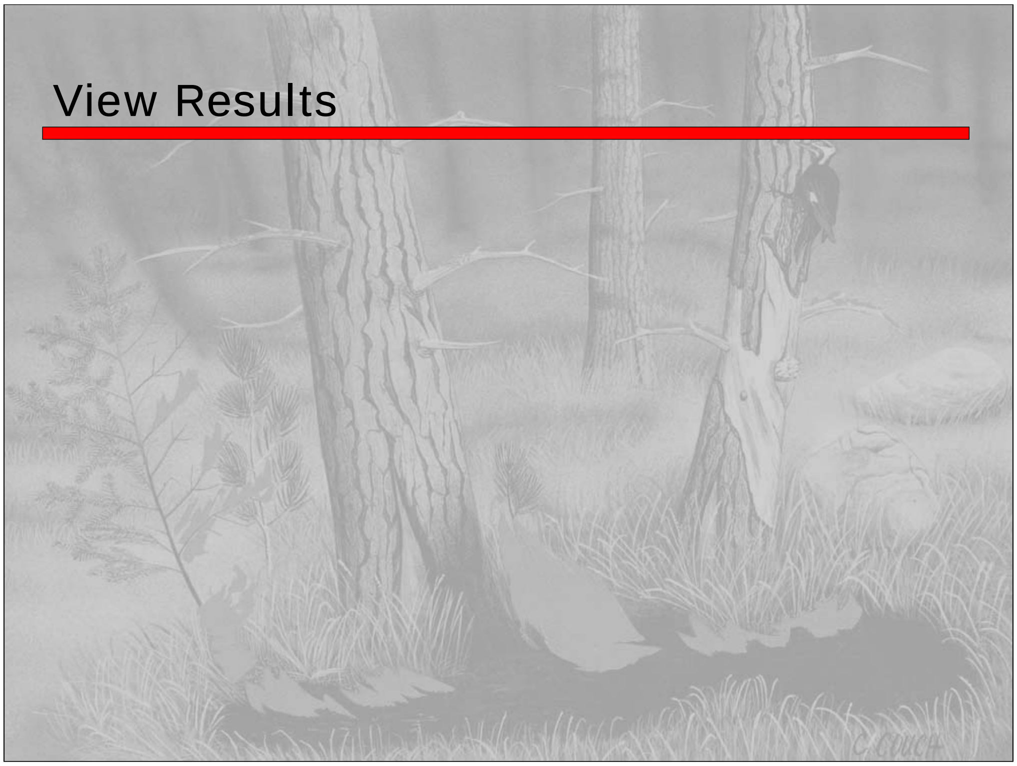


Another way to select the report is from the Main Menu list when viewing the Results of an FSPro run. Simply clicking on the Report button will open a new window with the Analysis Report active.

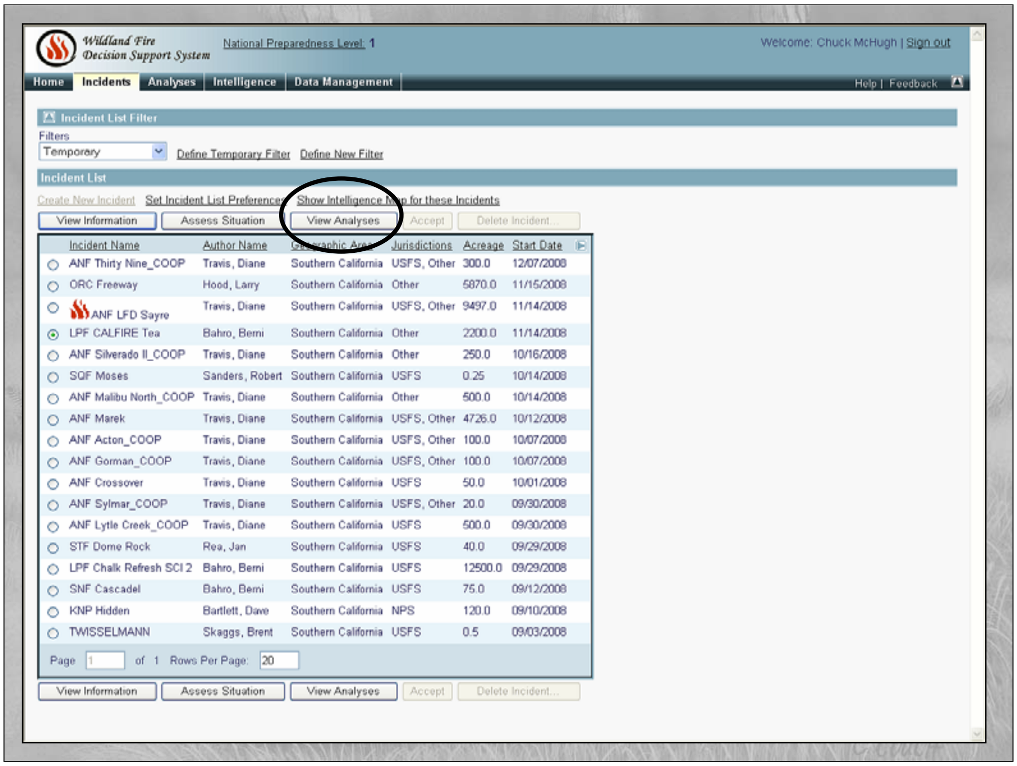


Here is an example of the beginning of an Analysis Report. At this time, you can either print or save the report. When you are done viewing the report, simply click on the Return button anywhere in the report and it will close the window and return you to your previous location in the system.

Because this report is in an html format, it does not lend itself to easily being saved. Printing out a hardcopy may be appropriate for the project record for documentation purposes. However, the report is always available within the WFDSS system as long as the associated incident or analysis is not deleted.

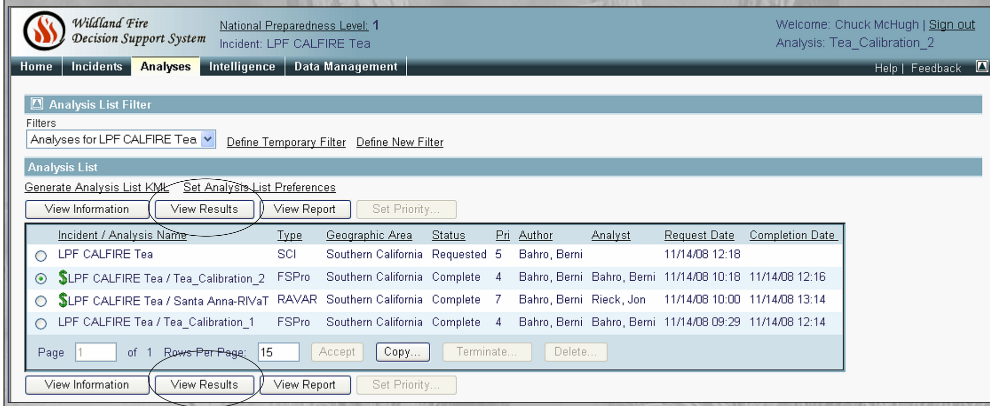


In this section, we will explore outputs available from the system that can be quickly evaluated and reviewed after a simulation has finished. For the purposes of this discussion, we will assume that you are the Fire Behavior Specialist responsible for the analysis and that you have accepted the analysis as complete. Remember that as a Fire Behavior Specialist, you can view only analyses that you are responsible for, that have been accepted and completed by another analyst, or if additional permissions have been granted to you specific to that incident or analysis.

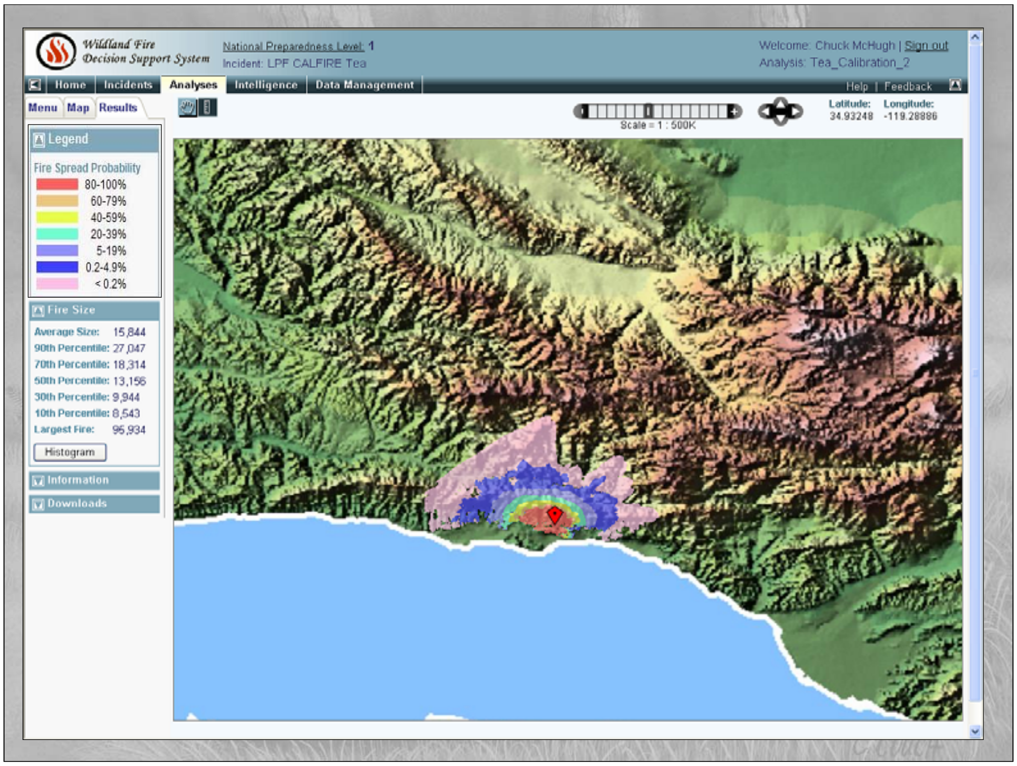


Before we can view analyses, you must first select an incident; until you do, the View Analyses button will be grayed-out. Since there will be numerous incidents active in the WFDSS system at any one time, don't forget to use Filters to help sort through these lists. In this example, the LPF CALFIRE Tea Incident has been selected, allowing us to view any analyses for which we have the appropriate permissions.

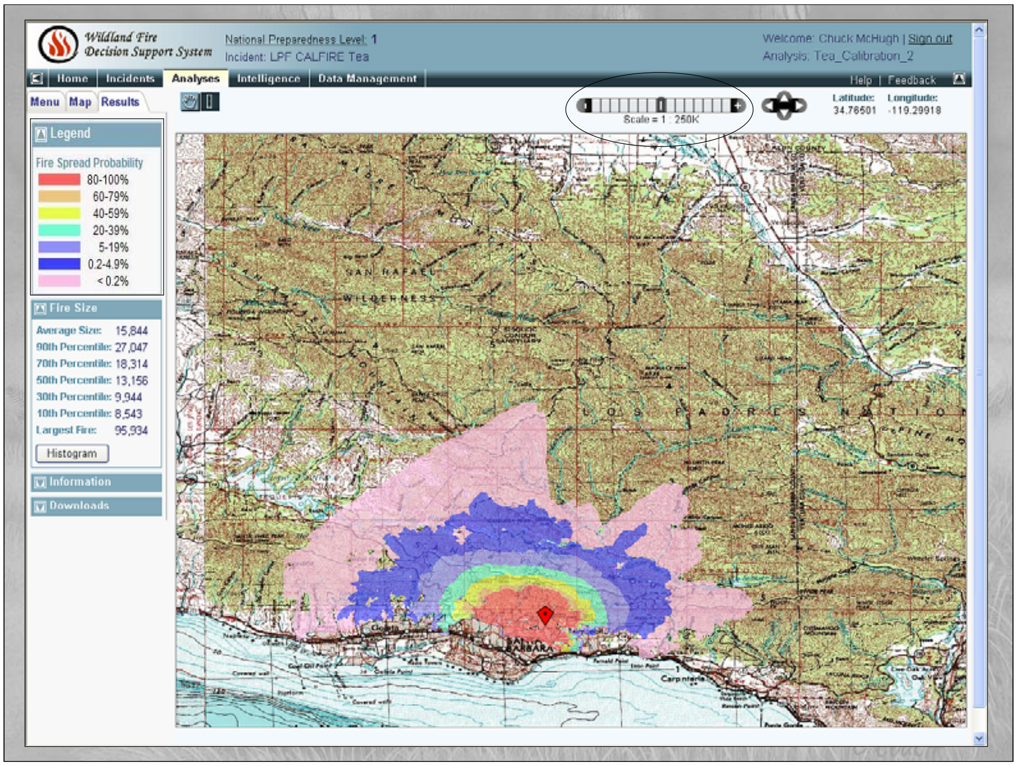
View Results



Once you have made an incident active and have selected View Analyses, a screen similar to this will open. All the analyses associated with that incident will be listed along with their type (SCI, FSPro, RAVAR), their status, and other pertinent information. In this view, select the particular analysis you are interested in and then the View Results button. In this example, we will look at the LPF CALFIRE Tea / Tea_Calibration_2 FSPro run.

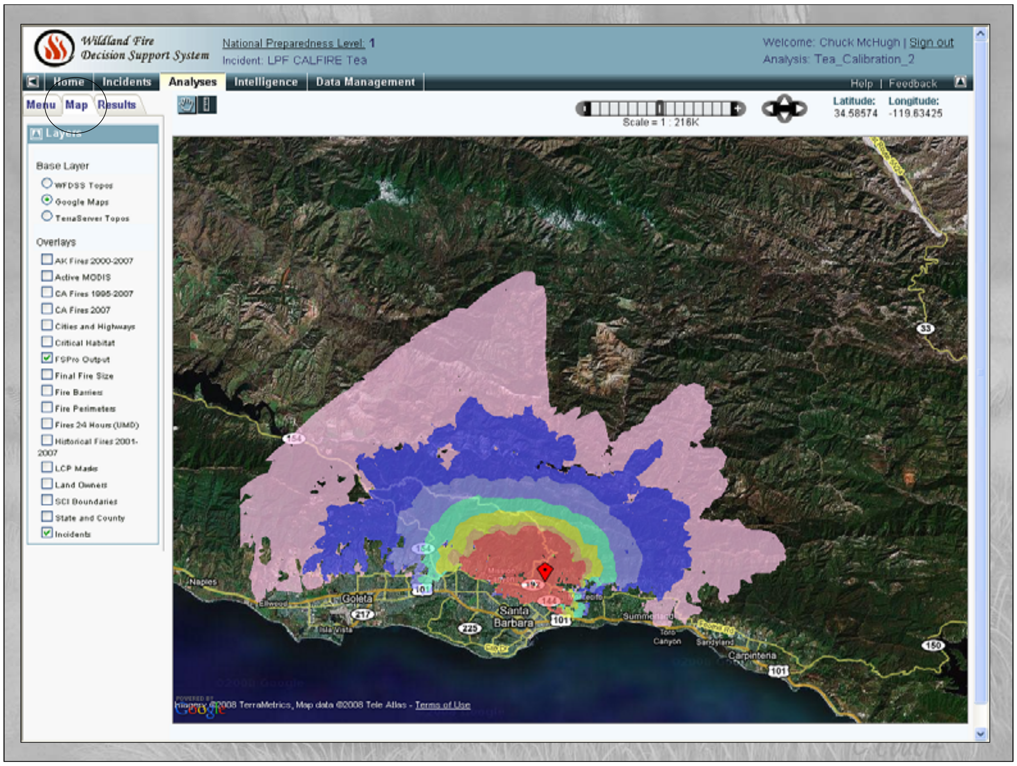


Once you have selected an analysis, be patient while this new view is loading. Until the screen looks similar to the one shown here, resist the urge to click another button or option. Once completely loaded into your browser, the view should look similar to this. At this scale (1:500K), a colored digital elevation model (DEM) hillshade relief with the FSPro output will be visible. By changing the viewable scale, you change the level of visible background detail.



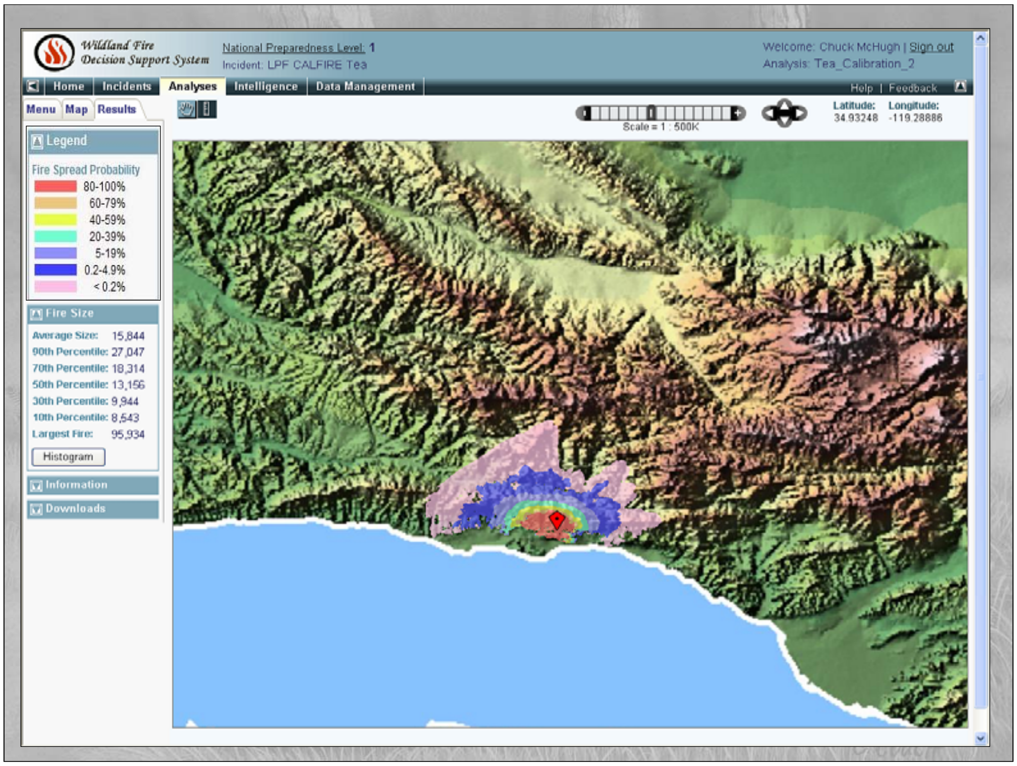
In this view, we have zoomed in just one click on the scale (black circle) to 1:250,000 (1:250K). This changes the background to a digital raster graphic (DRG) map. This view can help provide context to areas impacted by the FSPro output and aid in interpretation. You can also change the background to a Google Earth Map view at the Map tab.

When this view is displayed, users often wonder how to generate a map out of the system. Remember, the current philosophy of WFDSS is not to create maps, but to allow others to view model results once accepted by the analyst within WFDSS. However, at the moment, if you wanted to capture this view, you would need to do so as a screen capture. Screen captures can be created using stand alone programs such as PrintKey or by using the ALT plus PRINT SCREEN method to copy the current view and SHIFT plus INSERT to paste into a word document or PowerPoint presentation. The use of screen captures is a very effective and efficient method for sharing preliminary results with others during the calibration and critique stage to evaluate model results and make modifications or changes. Remember that on long-term events, you will likely not be the only fire behavior specialist; so, for documentation purposes, it is important that you capture the final results for inclusion into reports and planning documents.

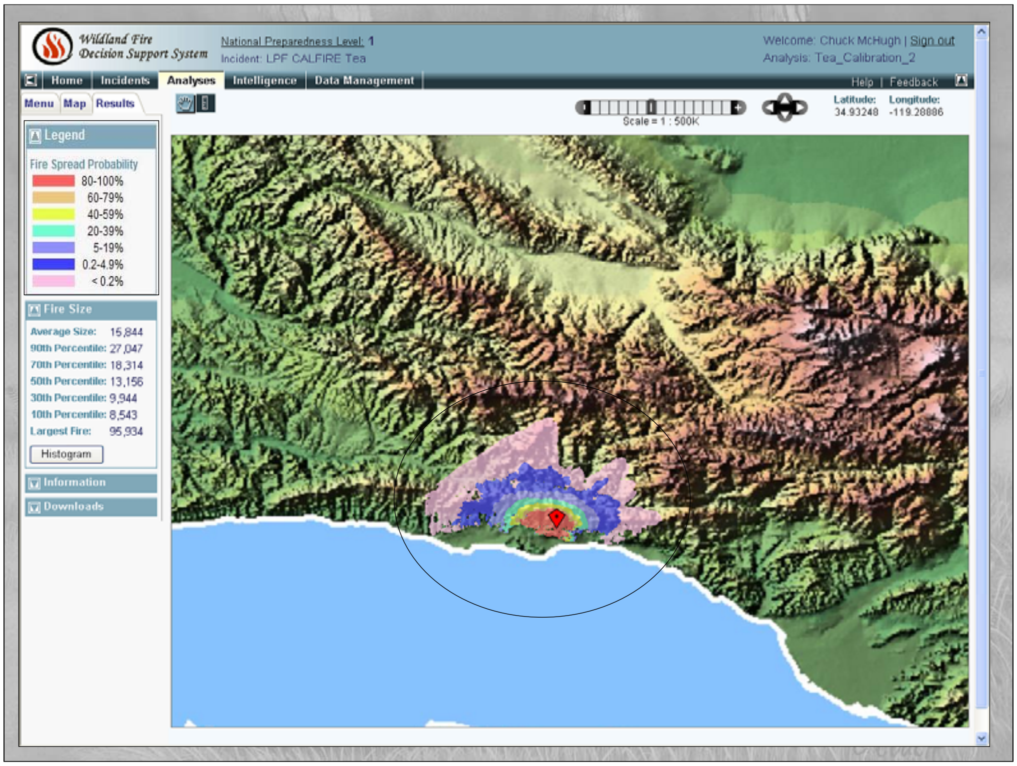


By selecting the Map tab and changing the Base Layer to Google Maps, an aerial photo image will be in the background. This also provides context for the FSPro output as well. Unlike viewing this information in Google Earth, it will be only a planimetric view. The view can not be tilted, rotated, or seen in a 3-D view as it can in Google Earth. As when the DRG background is active, changing the scale by zooming in or out will change the level of visible detail. In this view with the Map tab active, additional overlays such as Fire History, Fire Perimeter, Fire Barriers, or Landscape Masks used in the simulation can be added. Any or all of the additional overlays can help to add context to the view and assist in evaluating the FSpro Output. Some overlays such as the Active MODIS may be visible for only the last 12-24 hours, and the next time you load them they will not be visible or in a different location as the fire moves across the landscape.

The last series of slides were to remind you there are numerous views and ancillary data that can be brought into the system. One of your first steps in evaluating your run should be to view the data and examine the results. Use these various backgrounds and the overlays to critically examine and understand not only the results but also the area you are working in.



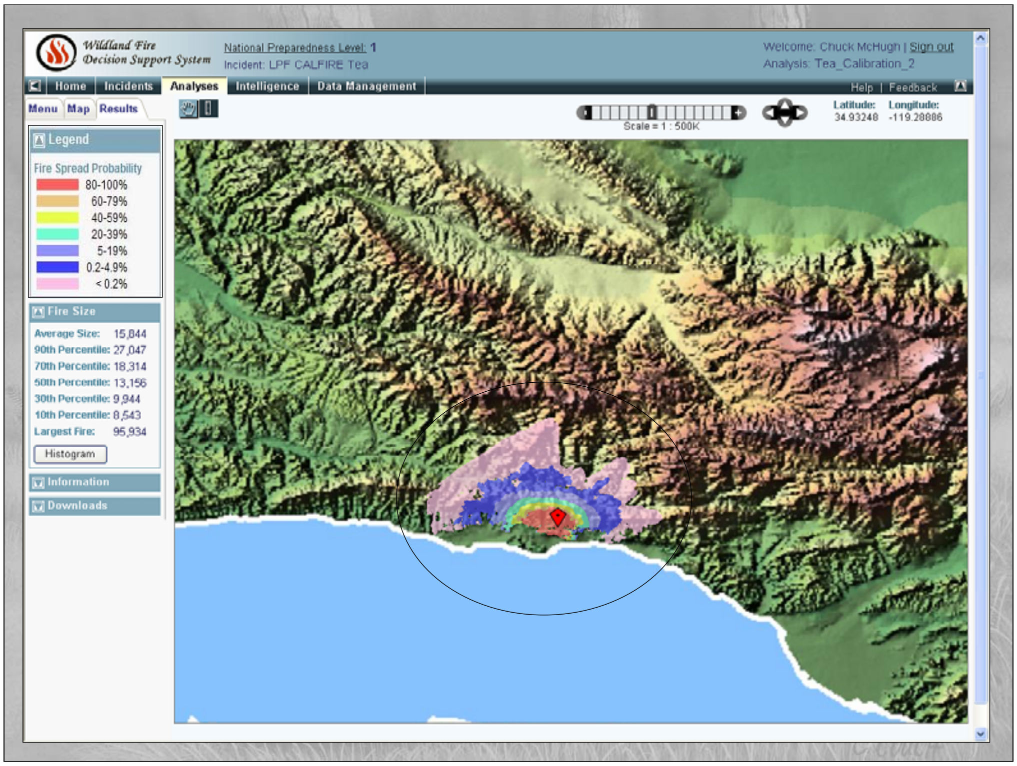
Now lets look at output that is easily viewed within the WFDSS system. Once again, we are back at the main section of the Results tab. When you first select an analysis, the view should look very similar to this. Your FSPro outputs should be in the main part of the screen. To the left there are four main headings: Legend, Fire Size, Information, and Downloads. Clicking on the arrow to the left of any heading will expand or contract the visible information.



The main output from FSPro is the fire spread probabilities. The output is the probability of fire burning a given area in the analysis timeframe. It is calculated by the number of times an area did burn in the simulation divided by the total opportunities (number of fires simulated) to burn. For example, if a point on the landscape was burned 50 times during a simulation and a total of 100 fires were simulated, the corresponding probability for that point would be 50%. A point in the <0.2% probability zone (pink area) burned no more than 1 out of 500 times, and thus constitutes a rare event.

The raw data output is continuous and is commonly referred to as a probability surface or probability grid. For ease of display and interpretation, the raw probabilities have been reclassified into the following discrete categories: 80-100%, 60-79%, 40-59%, 20-39%, 5-19%, 0.2-4.9%, and less-than 0.2%. This reclassified output is the most common way to view this information. When viewing or interpreting these classes, the terms probability bands, probability contours, or probability zones are synonymous.

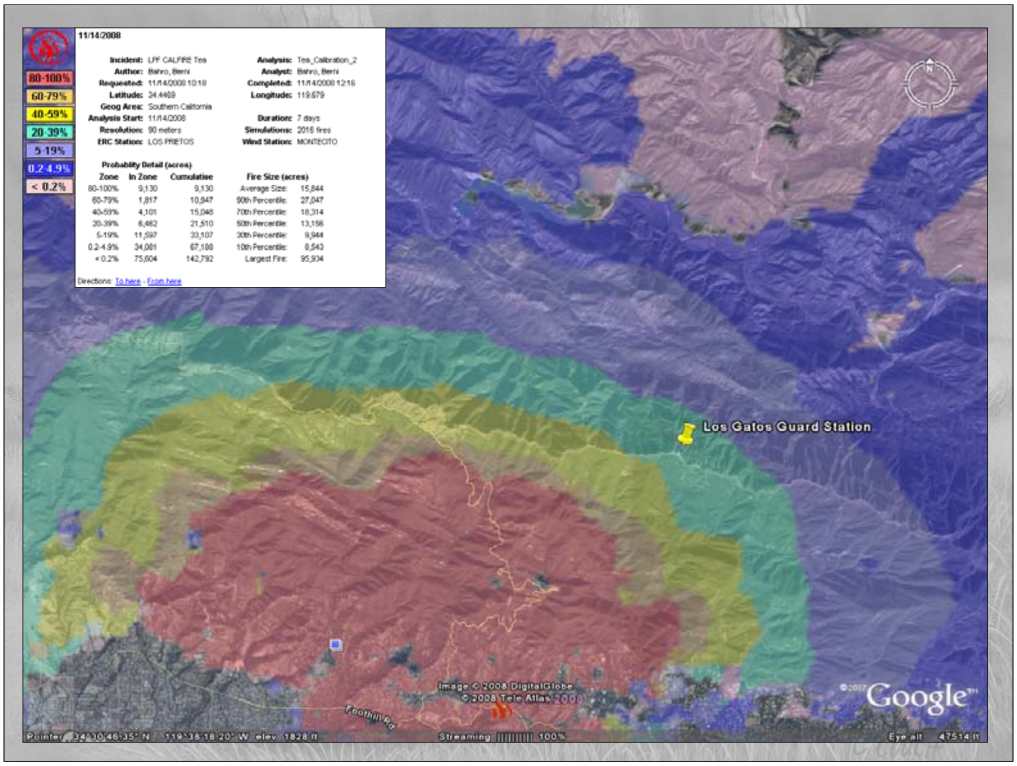
The discrete FSPro probability zones do NOT represent a fire progression, a fire perimeter, or fire sizes or shapes. These are common misinterpretations because of the distinct categories and colored shading. The source of this confusion may be that maps of fire progression or output from other geospatial fire modeling systems are often displayed as concentric contours. However, the discrete FSPro probability zones (80-100%, 60-79%, 40-59%, 20-39%, 5-19%, 0.2-4.9%, and less-than 0.2%) cannot be interpreted as related to fire progress since there is no assumption about how long simulated fires take to reach each zone. An important point to remember is that any area in the probability output can be reached on the first day of the modeled period or the last day, and it could reach that point as a head, flanking, or backing fire. Because of these issues, FSPro output can be used to make informed decisions regarding strategy, but not tactics.



Proper interpretation and communication of FSPro results are critical to accurate use of the information provided.

Improper interpretations include: 1) That there is a 25% chance of the fire having a perimeter with a shape that is outlined by the 0.25 shading; 2) That there is a 50% chance of the fire burning 4,101 acres by the end of the modeling period; and 3) That the FSPro probability output indicates the likely shape of the fire for the modeled period.

The proper interpretation would be that, within this probability zone (40-59%), there is a greater than 40% chance that any point within the probability zone could be impacted in the modeled period.

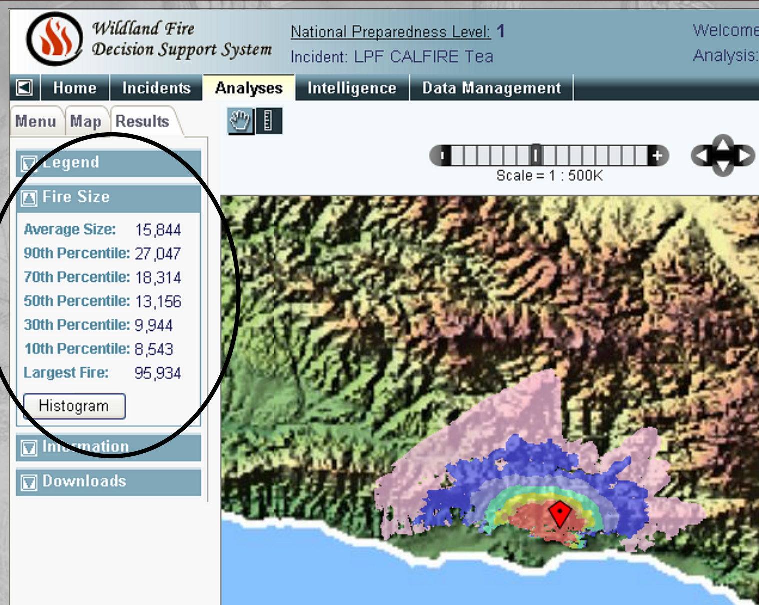


In this example in Google Earth, we are viewing the FSPro Probability output for a seven day simulation duration with 2,016 simulated fires. The point of concern is the Los Gatos Guard Station. The manager wants to know what the probability is of the Los Gatos Guard Station being affected in the next seven days.

For this example, the interpretation would be as follows: There is a less than 40% probability (chance) that the Los Gatos Guard Station would be affected in the next seven days based on the simulation.

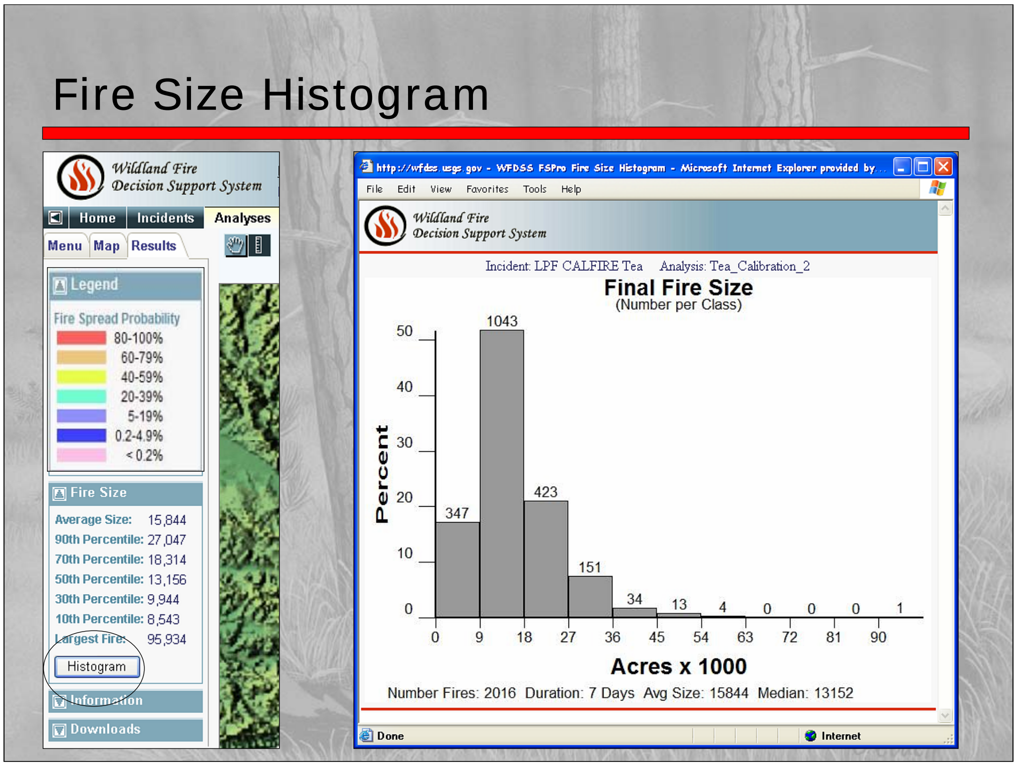
Of course, this interpretation is based on the current position of the fire when it was modeled and the accuracy of the underlying fuels information and the assumptions the analyst used in selecting RAWS stations for ERC and Winds information under the forecast information used and the wind/weather scenarios selected. Will this probability remain the same throughout the lifespan of the fire? Perhaps, but not likely. As the actual fire position changes due to successful suppression activities or significant weather events that could affect fire movement (for example a dry cold-front), these probability zones may expand and contract. The take-home point is that as new and better information becomes available, these probabilities will change. New simulations would be required accounting for changing conditions, which would likely affect the probabilities associated with the point of concern.

Fire Size Distributions - Summary



For every FSPro simulation, the individual modeled fire sizes are tracked, and at the initial Results view, a summary is visible. This summary provides a list of the largest and average modeled fire as well as five different percentile breakdowns of fire sizes. These categories are defaulted and cannot be changed by the analyst. In this example, the average fire size for the simulation was 15,844 acres, with the largest fire being 95,934 acres. Interpretation of the percentile classes should be familiar to you from dealing with information regarding climatology from FireFamily Plus. Lets look at the 90th percentile. We can say that only 10% of all the simulated fires were greater-than 27,047 acres. Conversely, we can say that 90% of all the modeled fires were less than 27,047 acres.

A graphical representation of this information in the form of a Histogram can be viewed by selecting the Histogram button. It is important to remember that the fire size distribution summary and histogram provide no information on the exact fire size to expect for the modeled period. They provide the analyst with only information on the range of modeled fire sizes in relation to the total number of fires during the simulation.

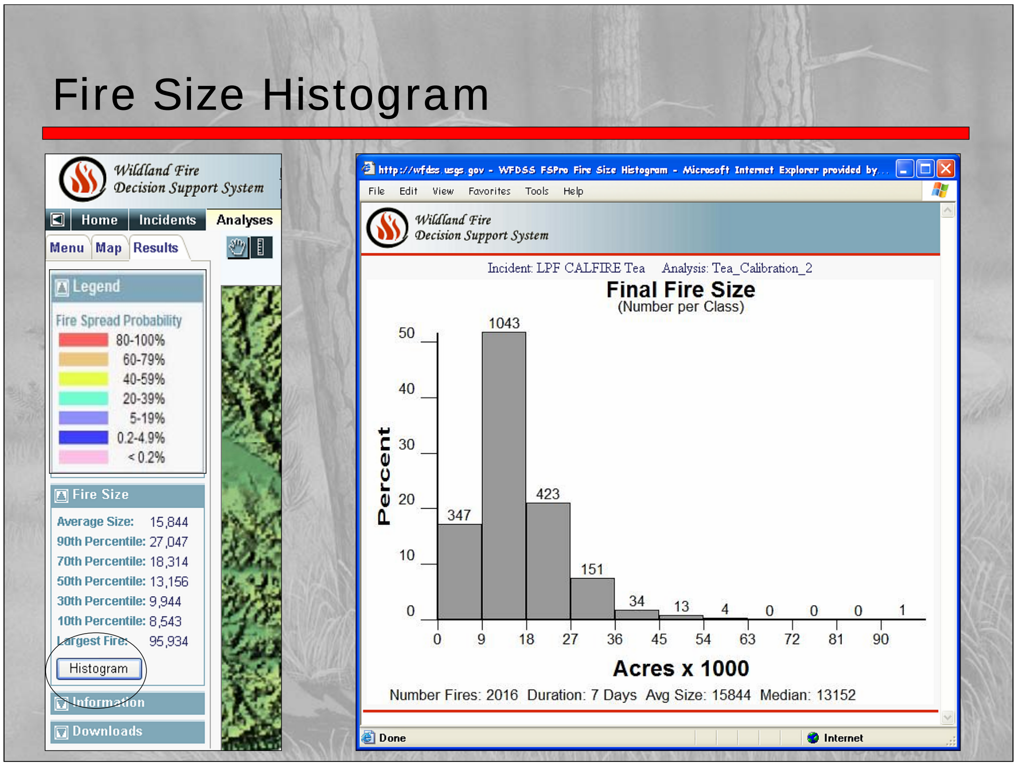


In this view, the Fire Size summary legend is juxtaposed to the corresponding Histogram. When you select the Histogram from the main Results view, a new browser window will open with a histogram version of this information. You can print the histogram or use a screen capture to copy and insert it into a document. However, a jpeg version of the histogram is also available for download containing the same information that you find in this view. We will discuss the download option later in this lesson. For now, concentrate on the output viewable here.

The X-axis (horizontal) is grouped into distinct classes in acres and will be multiplied (x) by some base ten value. In this case, you would need to multiply the x-values by 1000. For example, the class range of 18 – 27 represents fires from 18,000 – 27,000 acres. For another FSPro simulation, this value could be 100. It depends on the range of the fire sizes encountered during the modeling as to the specific scale used. We can also see the total number of fires that fell into this range: 423. The number of fires by class are located at the top of each bar.

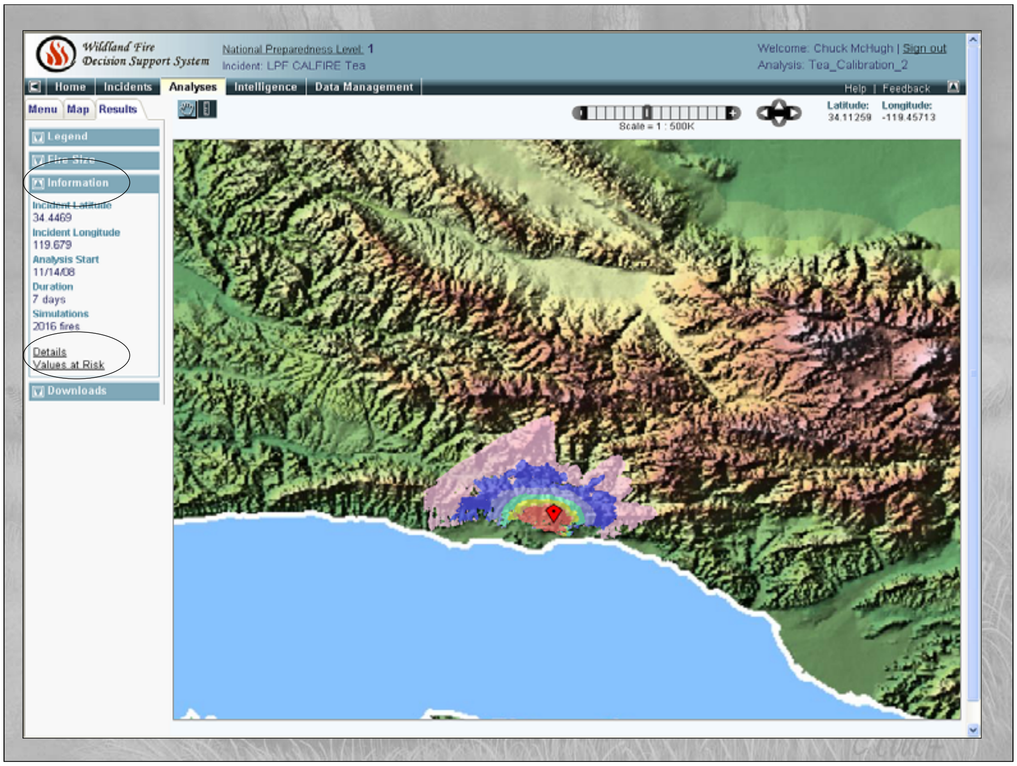
The Y-axis (vertical) is the percent of total fires by size class. If we look at the first size class of fires 0-9 (0 - 9,000 acres), we can see that approximately 17% of the total number of fires were in this class. Above the bar for this class is the number of fires (347) recorded in this size range. The exact percentages for each class can be calculated by dividing the number of fires within a class by the total number of simulated fires.

At the bottom of the figure is the Number of Fires modeled in the simulation, the Simulation Duration, the Average Fire Size, and Median Fire Size.

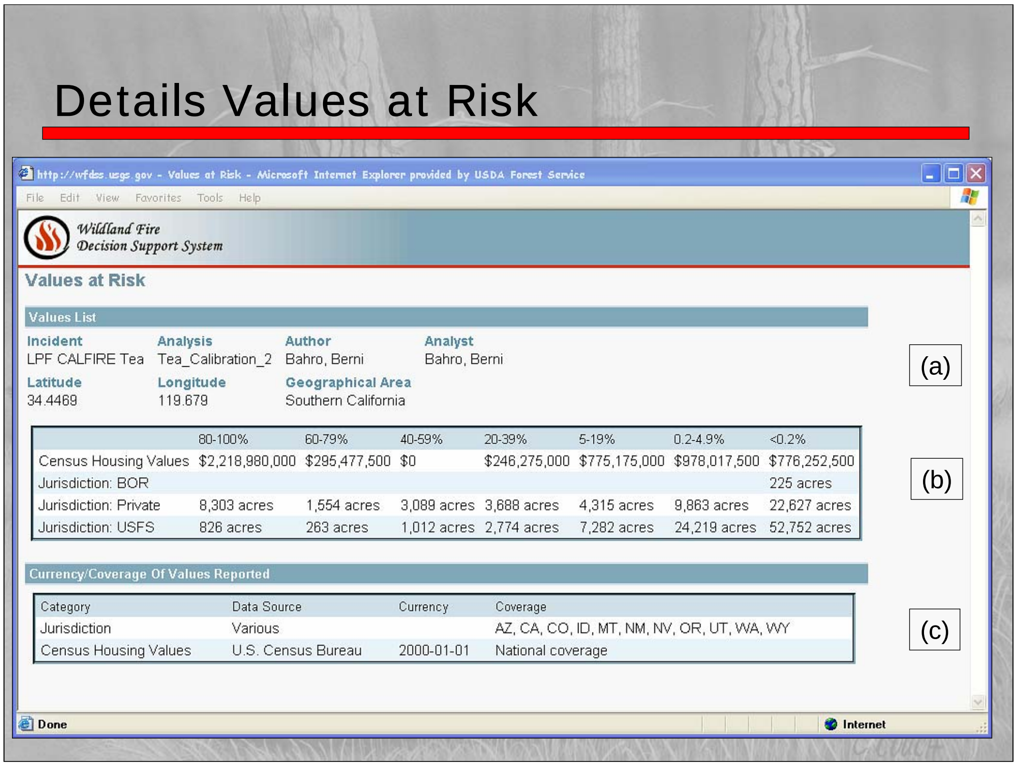


The fire size distribution summary and histogram provide no information on the exact fire size to expect for the modeled period. They provide only the range of modeled fire sizes in relation to the total number of fires during the simulation. In this example using fire size distribution summary and the histogram, we can see that the average fire size was 15,844 acres and the median fire size was 13,152 acres. We can also tell that the largest fire was 95,934 acres, and by looking at the histogram, we can see a fire of this size occurred only once, and likely represents a rare, yet significant event.

If the fire sizes within a simulation distribution are significantly larger or significantly smaller than the recorded historical record of fire sizes experienced in a locale, this may suggest that the analyst needs to go back and review model settings, selected RAWS stations used to generate ERC and Winds, and review the landscape information used in the simulation. If the probability surface shows little to no < 0.2% probability zone and very few large fires are reflected in the distribution, this may indicate that significant or rare events have not been captured by the simulation. If rare events are absent from a simulation, it is often due to the fact that not enough fires have been simulated to capture these type events. If rare events are of concern for the current fire, you will likely need to increase the number of fires simulated.



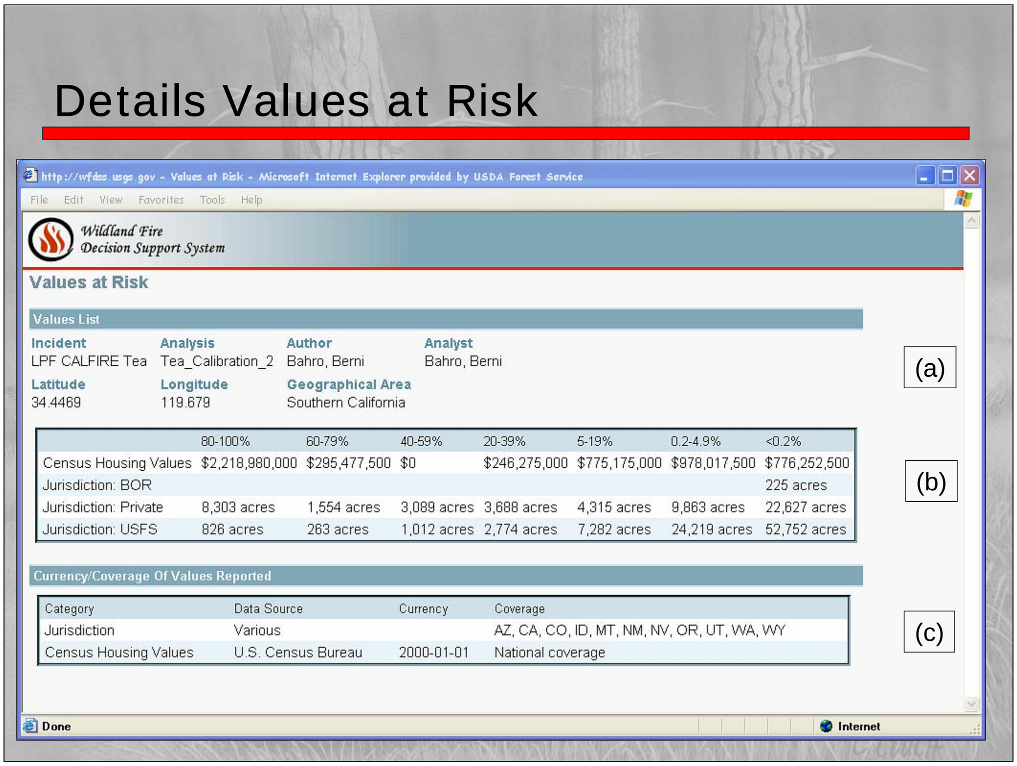
Okay we are now back at the main Results view. Here we have expanded the Information Heading. This provides us with some useful information, such as the entered latitude and longitude for the incident location, the start date of the incident, the simulation duration (7 days), and the Number of Simulations (2,016 fires). There is also another selection available to us from this view: Details of Values at Risk. Selecting this option will open a new browser window with a summary table of values at risk associated with the FSPro run.



This quick summary table should NOT be confused with a full Rapid Assessment of Values at Risk (RAVAR) analysis, nor should it be substituted for one. It is meant to provide only a quick analysis and summary of the potential values at risk. This quick assessment is based on data currently loaded in the WFDSS system; as such, not all of the avialable data on structures, power lines, critical habitat, etc. that are assessed in a full RAVAR analysis for all areas of the country been uploaded into the WFDSS system. Over time, the level of information contained in the WFDSS system will be improved and expanded upon. Note that Lesson 4 of this unit will go into more detail concerning RAVAR assessments and corresponding products.

The section labeled “a” on the slide provides basic information regarding the author, incident name and location, as well as the geographical area it is in.

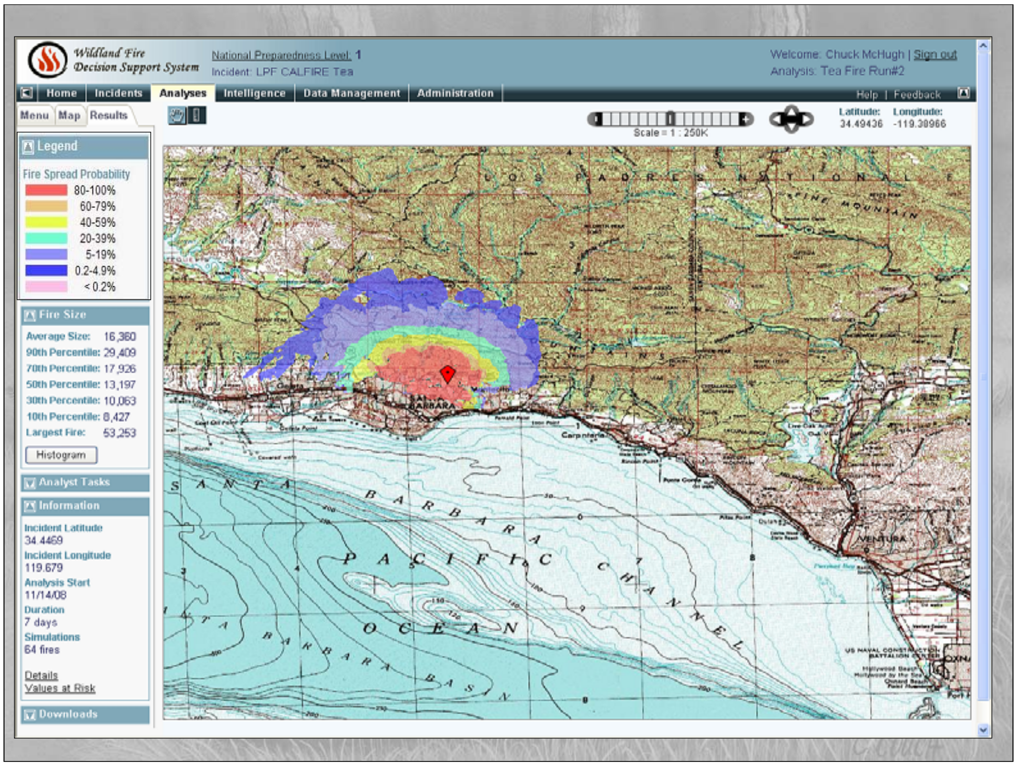
In the section labeled “b”, you can see the acres by ownership within each of the discrete probability zones. These acres are not cumulative and represent the actual acres contained within each zone. In this example, USFS are Forest Service and BOR is the Bureau of Reclamation. These acres should be very similar to the acres by ownership from a RAVAR analysis since this data layer is fairly stable.



A rather large discrepancy can exist for the Housing Values displayed here (section b) when compared to a full RAVAR analysis. In this table, the housing values listed by probability zone are not cumulative; rather, they are listed by each discrete probability zone and provide no information on the number of structures threatened. The Census Housing Values in the table are based on the Census Block data without adjusting for inflation. These values can be quite different from those calculated in a RAVAR analysis. For a RAVAR analysis, housing values are based on an inflation-adjusted average county home value. For some areas of the country, the dollar values listed here can be absent, totally incorrect, or grossly underestimated.

If we were in an area that had Critical Habitat layers loaded into the system, we would also see the acres by probability zone displayed here as well.

Section "c" provides information on the currency of the data reported in section b. Here we can see that the Jurisdiction data (ownership) is from a variety of sources and basically covers the 11 western states. For the Census Housing Values, we gain some more information, especially regarding its currency. From here we can see that the coverage being used was current as of January of 2000.



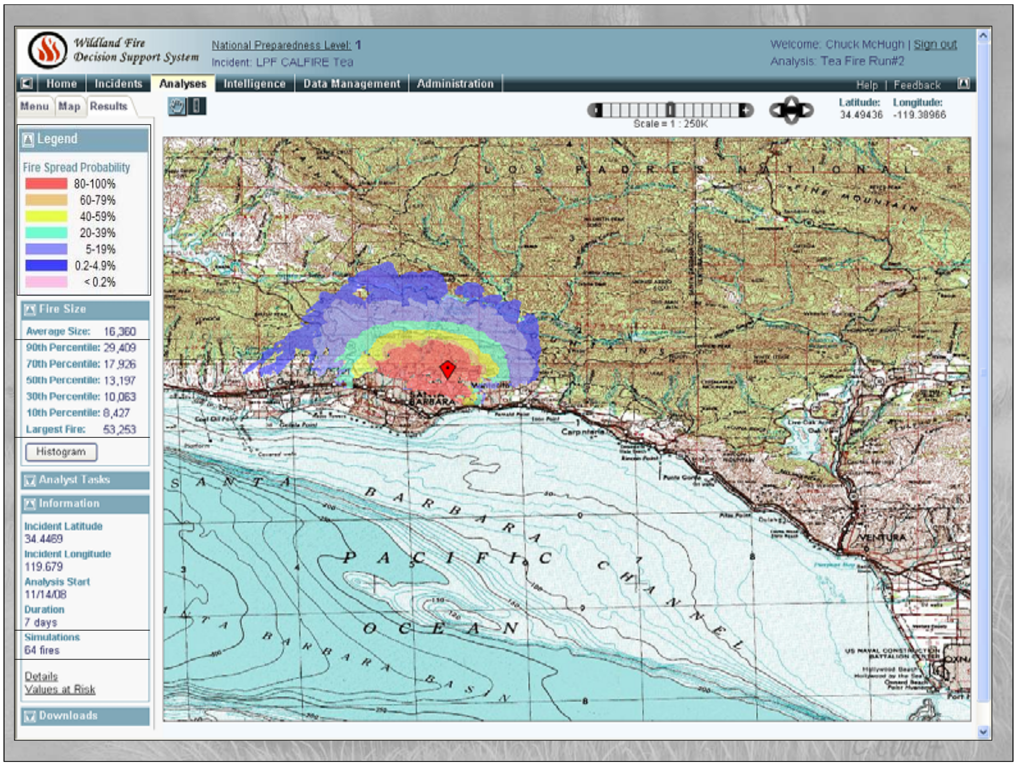
Previously, we mentioned that if the area of < 0.2% (rare event) was absent from the FSPro output, the likely cause was too few fires being simulated. This example is the same fire we have been looking at throughout the last section. Notice the difference in the Fire Size Distribution and the FSPro probability zones for this analysis compared to the previous analysis results. From the information contained in this image can you determine the following?

What was the average fire size during the simulation?

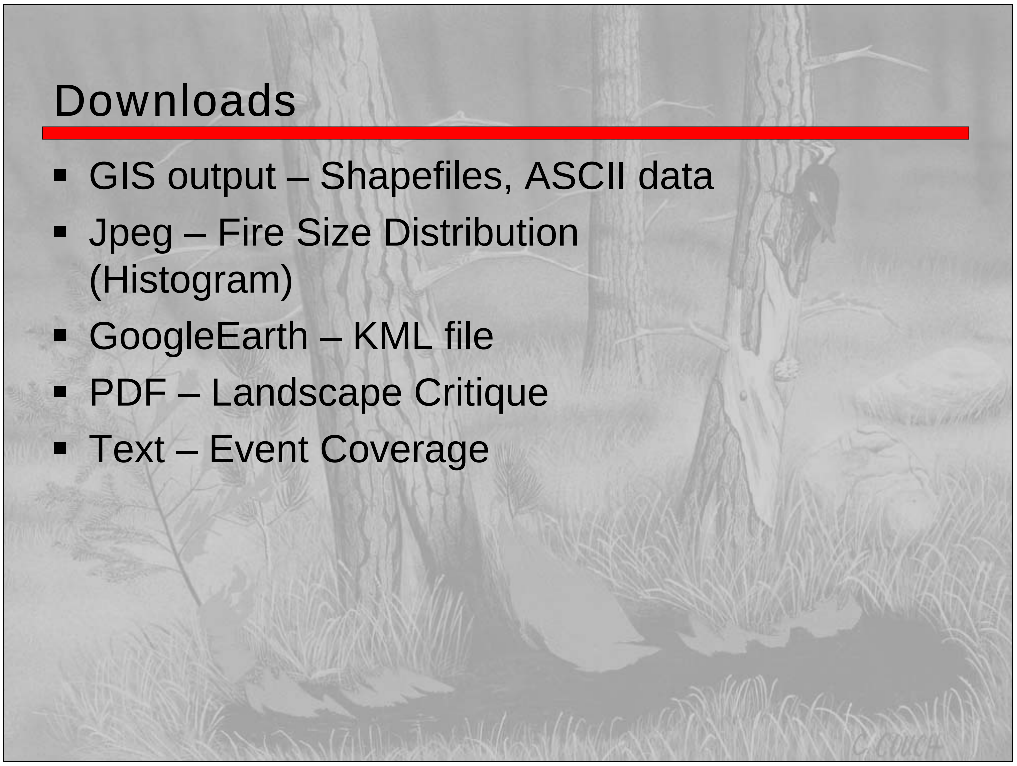
What was the largest fire simulated?

What was the simulation duration?

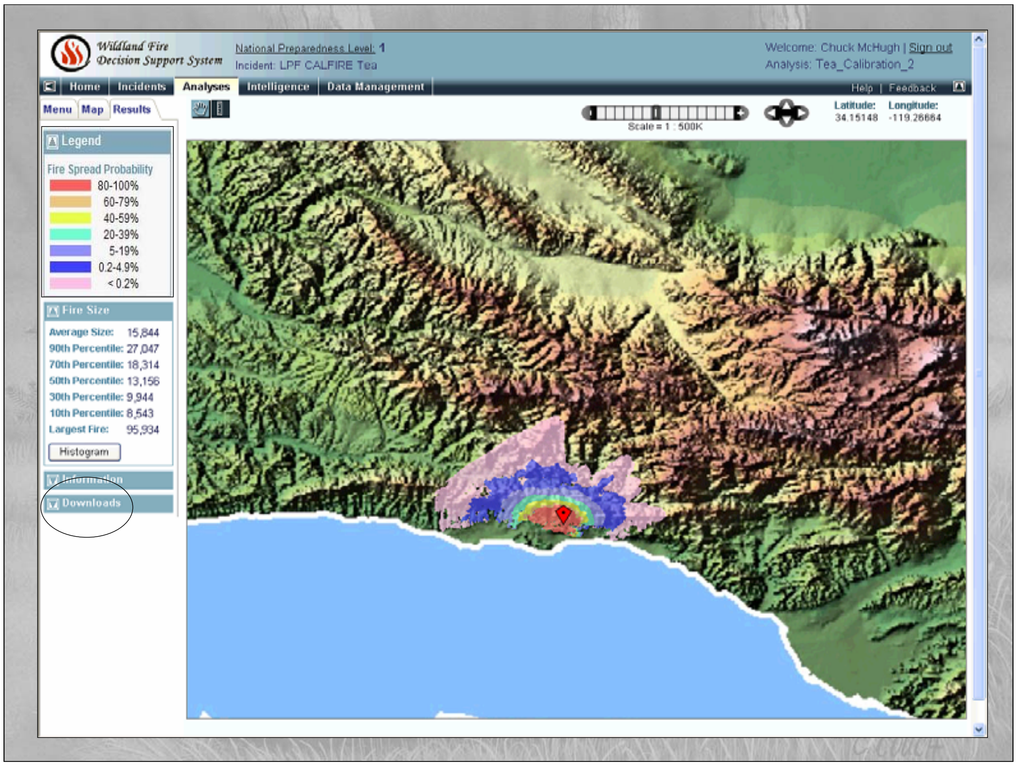
How many fires were simulated in this analysis?



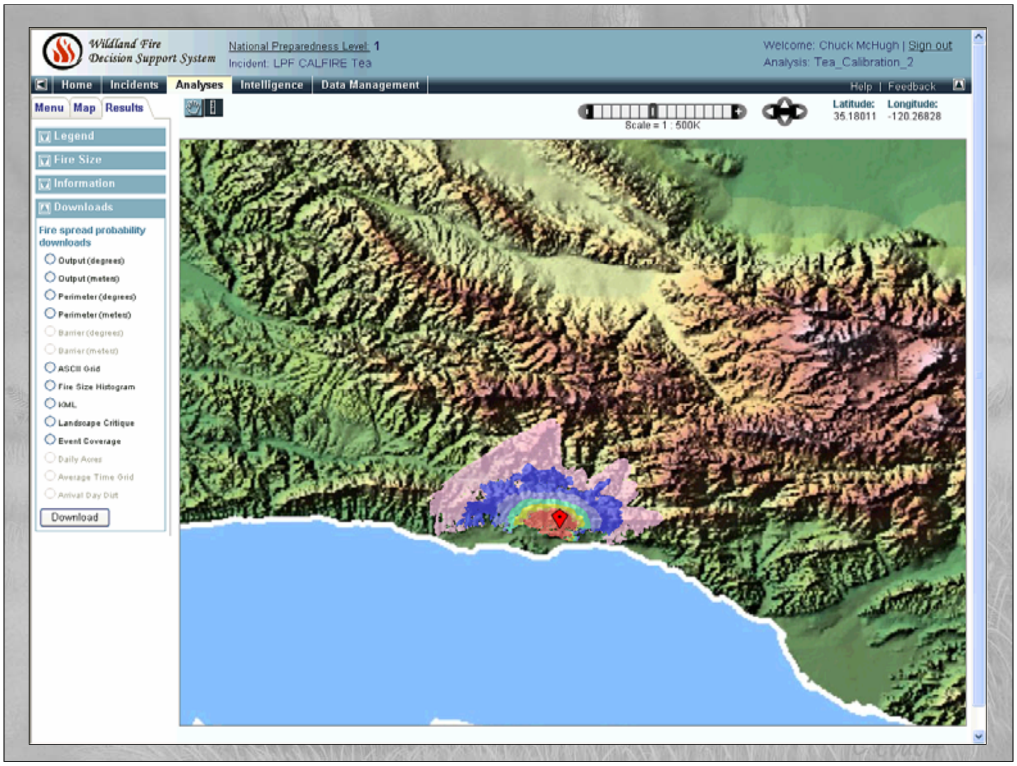
Did you determine that the average fire size was 16,360 acres and the largest fire was 53,253 acres? From the information contained in the image you should have determined that the simulation duration was seven days and the number of simulations for this analysis was 64 fires. The results here are quite different than the previous analysis results that were based on over 2,000 fires. Because of the small number of simulated fires and the lack of a less than 0.2% probability zone, you should be hesitant to accept this as a final run.



In the next section of the lesson, we will discuss the other outputs available from the system, which are listed here on this slide. All are available only after the FSPro simulation has completed. All have to be downloaded from the system to a local computer to be viewed or worked with. Some of the outputs will require further manipulation to be appropriately viewed via GIS and at least the KMLfile can be directly used in another program with no further intervention by the user.

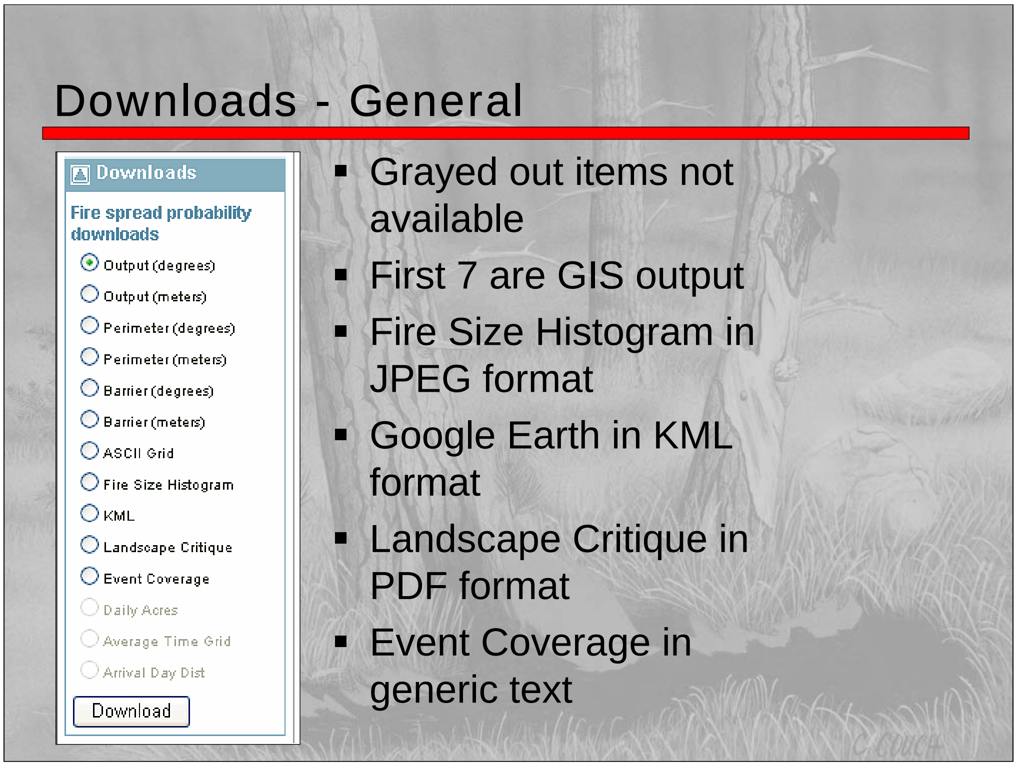


From the main View Results area in WFDSS, we need to expand the section under the Downloads Heading. Until you do, none of the files available for download will be visible.



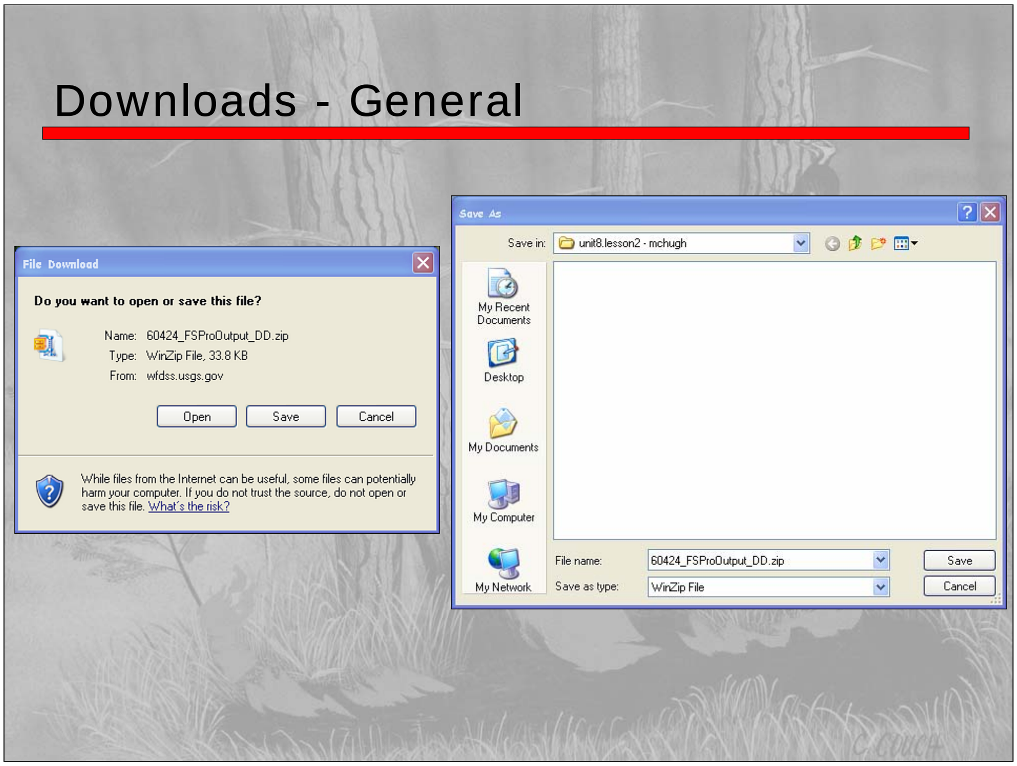
After expanding the section, a list of all the outputs available for download will be visible. All grayed-out items are not available, whereas all the dark black items are.

In the example here, the Barrier file is not available because a barrier was not used in this simulation. The other unavailable items are experimental products and not available to the general WFDSS user population at this time.

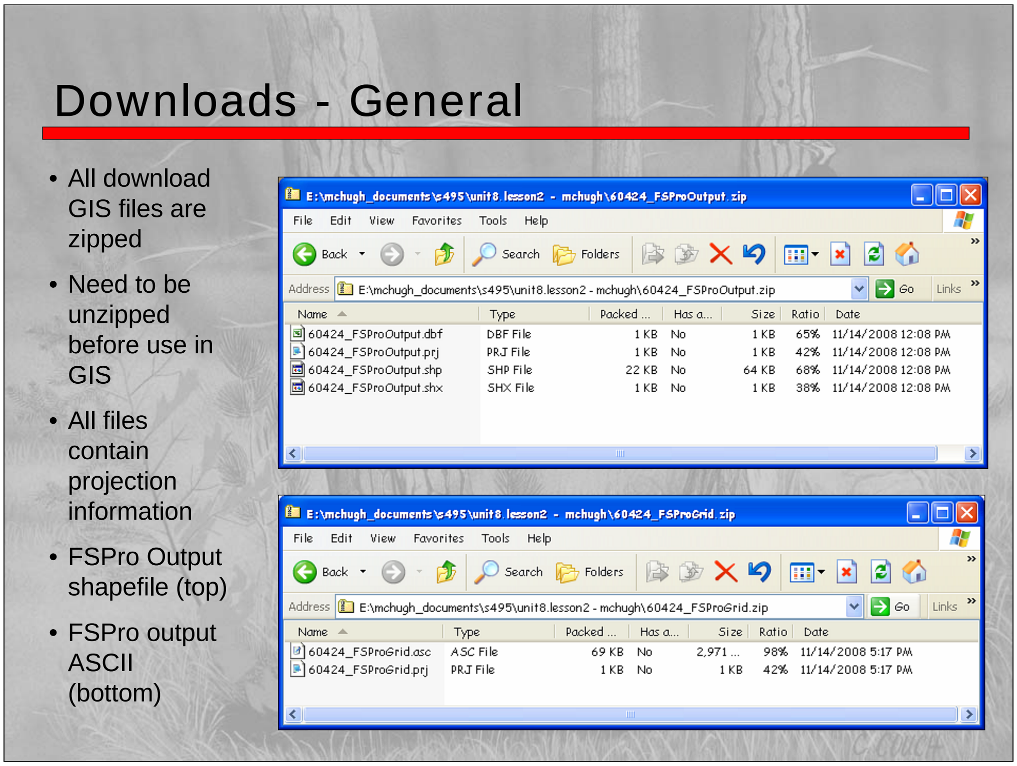


Any item that is not grayed out is available for download. The first seven items in the list are all GIS output. The Fire Size Histogram is a jpeg version of the histogram we discussed earlier. The KML is a Google Earth ready file of the FSPro output, and the Landscape Critique and Event Coverage reports are a PDF and generic text file, respectively. Throughout this section, we will discuss in more detail each of these output types.

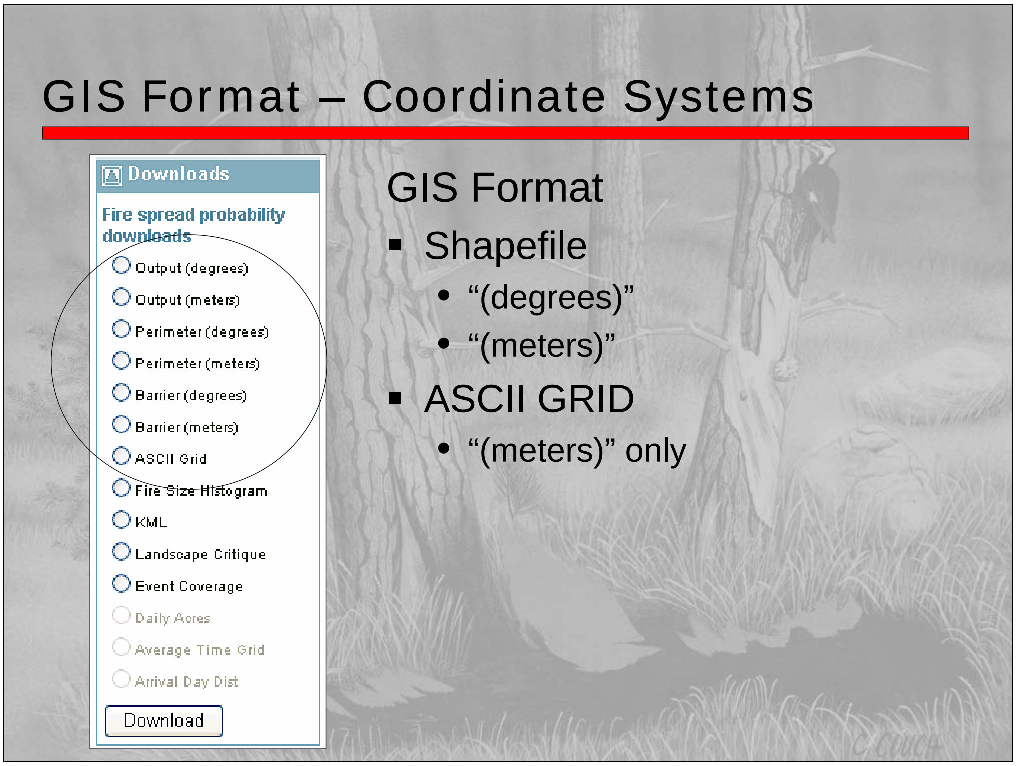
Any of the available outputs can be downloaded but first we must select the one we want. You can select and download only one item at a time. In the example on this slide, the Output (degrees) is currently active. Once an output type is active, we can select the Download button.



Selecting the Download button will first open the File Download dialog box (see the left image on the slide). With the possible exception of the two text reports, it is recommended that you not open them but rather save them. Selecting the Save button will open the Save As dialog box, seen here on the right of the slide. You can then navigate to the location where you want to save the information. This process should be familiar to most by now.



All of the downloaded GIS files are zipped to create smaller file sizes. The GIS outputs are the only files that are zipped , and all GIS files will need to be unzipped prior to being available for use. In the example on this slide, we can see the files associated with a shapefile (see the top image) and the ASCII GRID file (see the bottom image) within each zip file. To unzip the files, navigate to the location you downloaded the files and just double-click on the file name. The files are in the standard Windows WinZip format, and you should see windows similar to those shown on this slide. This of course assumes that WinZip is installed on the computer you are using. If it is not, you will need to contact your IT support to have the program installed.

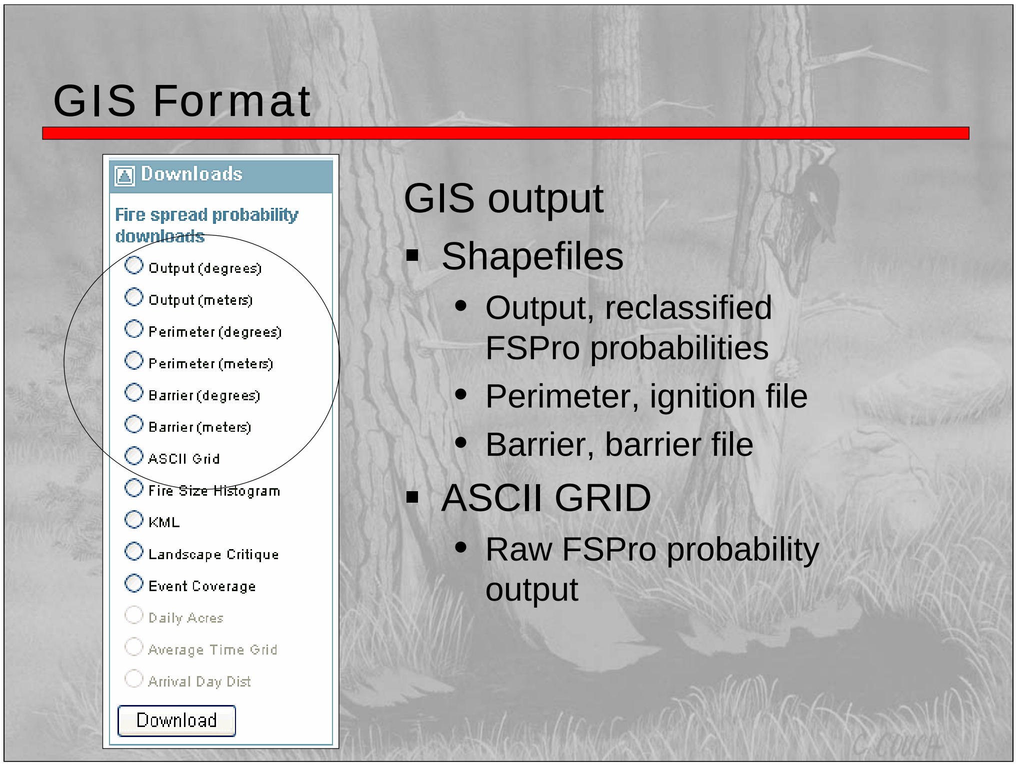


We will not be going into the specifics of manipulating available FSPro GIS outputs. Unit 4 "Concepts for Working with Geospatial Data in Fire Modeling" went into detail about map projections, viewing, and using and manipulating geospatial data within GIS. The intent here is to inform you of what the data are and items to be aware of to successfully manipulate the data in a GIS program such as ArcMap.

The two formats of GIS output generated by FSPro are shapefile and ASCII GRID. We will discuss each of the data files in detail in the following set of slides. However, before we do, a quick word on coordinate systems and map projections. The shapefiles for the FSPro Output, Perimeter, and Barriers are provided in two different map projections: geographic and projected. The map projection types are designated in the figure as "(degrees)" for geographic and "(meters)" for projected; the ASCII GRID, however, comes only in the projected coordinate system as "(meters)".

The geographic coordinate system used is NAD83 with decimal degrees as its units. The projected coordinate system used is a custom Albers projected coordinate system with its units in meters. The map datum is NAD83 and is designed to minimize map projection distortion at the area of interest. Because of ArcMap's ability to project on the fly, you may download the shapefile in either projection and they "should" display properly with any other data within ArcMap, provided that all the data have their coordinate system information correctly defined. However, if you plan to use any of these outputs as ancillary data with the WFDSS-generated landscape (.LCP) file (refer to Lesson 1 of this unit) in a geospatial fire decision support system such as FARSITE or FlamMap, you will want to download the shapefile with the custom Albers meters projected coordinate system.

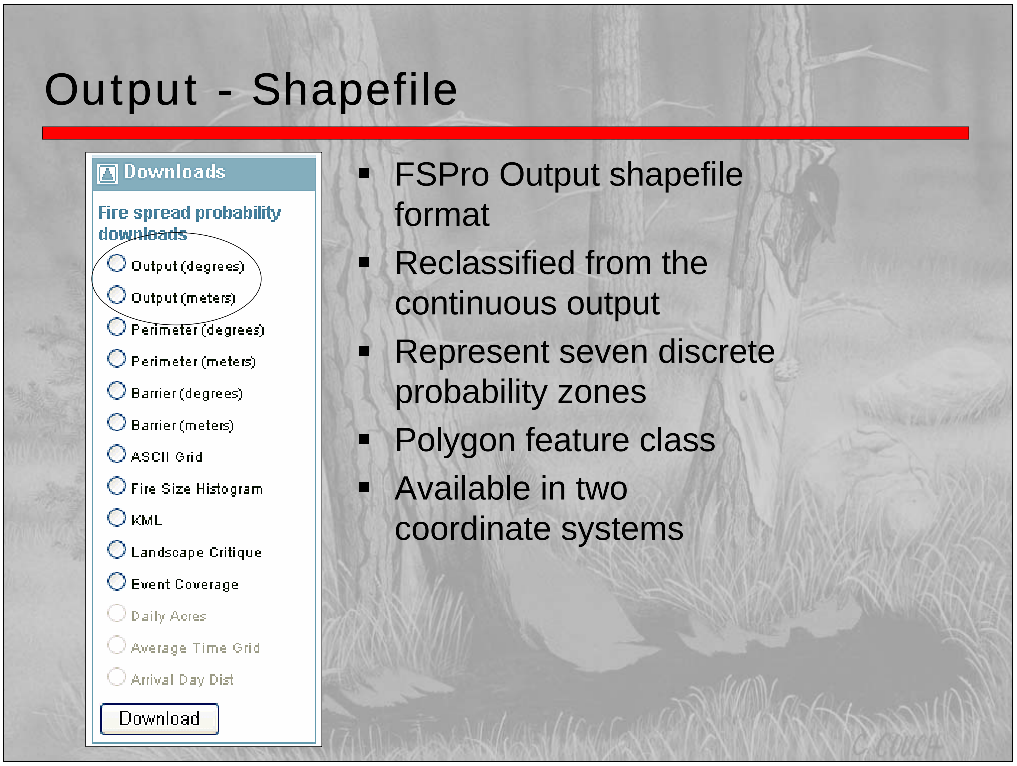
Revisit Unit 4 for a more detailed description on map projections if you need to freshen up your understanding of this material.



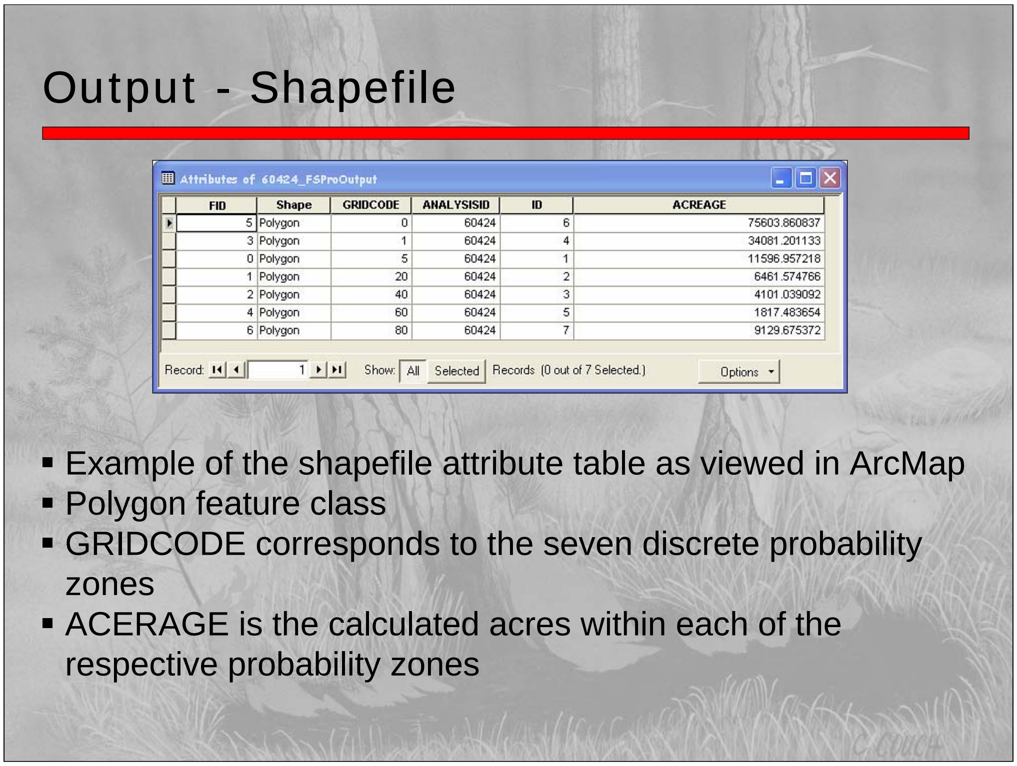
As mentioned, the two formats of GIS output generated by FSPro are shapefile and ASCII GRID.

Three different data types are available in Shapefile format: 1) Output, which is the continuous FSPro probabilities reclassified into the seven discrete probability zones typically displayed and discussed throughout the lesson; 2) Perimeter, which is the ignition file used by FSPro for the simulation. The ignition file was either uploaded by the analyst or created by the analyst in WFDSS; and 3) Barrier, which are any barrier files (roads, streams, previous fires, completed fireline, etc.) that were uploaded by the analyst or created by the analyst in WFDSS.

The ASCII GRID data are the raw continuous probability output in an ASCII text file as floating point data. This information is best viewed in ArcMap by converting it into the appropriate GRID format prior to use.



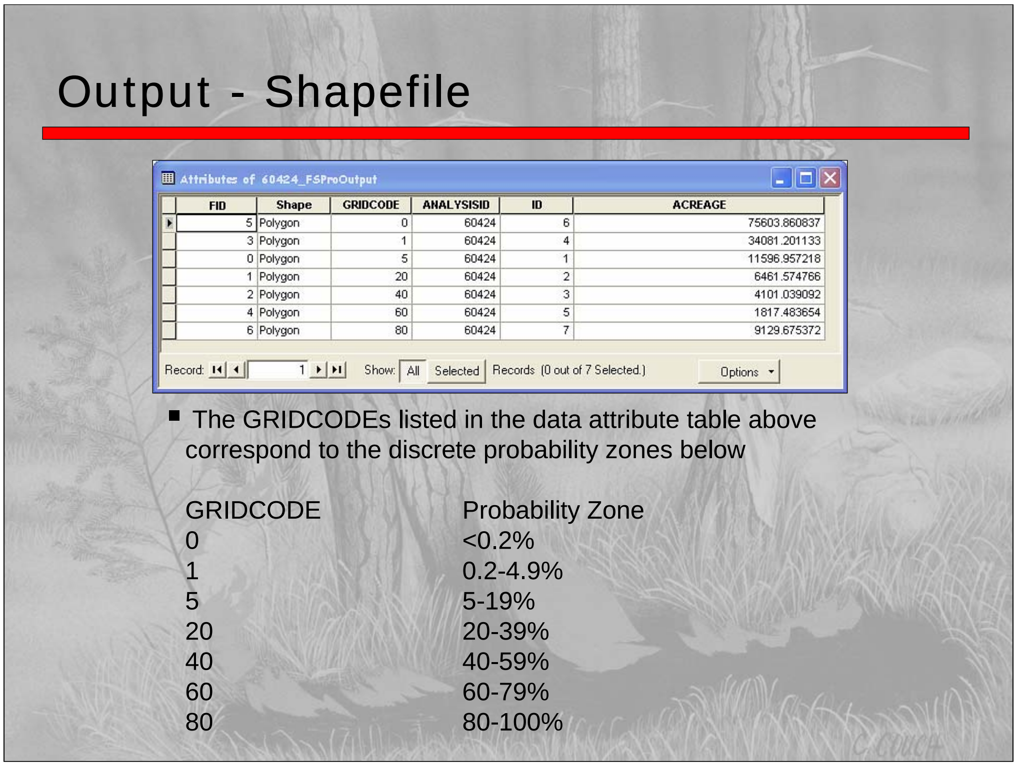
The downloaded output is a shapefile that has been reclassified from the continuous FSPro probabilities (ASCII GRID data). The data, as they are presented in this shapefile, represent the seven discrete FSPro probability zones (polygon feature class) we have seen throughout most of this lesson. The data are available in the two different coordinate systems we discussed previously.



FID	Shape	GRIDCODE	ANALYSISID	ID	ACREAGE
5	Polygon	0	60424	6	75603.860837
3	Polygon	1	60424	4	34081.201133
0	Polygon	5	60424	1	11596.957218
1	Polygon	20	60424	2	6461.574766
2	Polygon	40	60424	3	4101.039092
4	Polygon	60	60424	5	1817.483654
6	Polygon	80	60424	7	9129.675372

If you were to load the shapefile into ArcMap and open the associated shapefile data attribute table, it would look very similar to the example on this slide. The features of this shapefile are polygons. The GRIDCODE field corresponds to the seven discrete FSPro probability zones. Here, the data are sorted based on the GRIDCODE Field in ascending order.

The ACERAGE value equals the calculated acres within each of the respective probability zones.



FID	Shape	GRIDCODE	ANALYSISID	ID	ACREAGE
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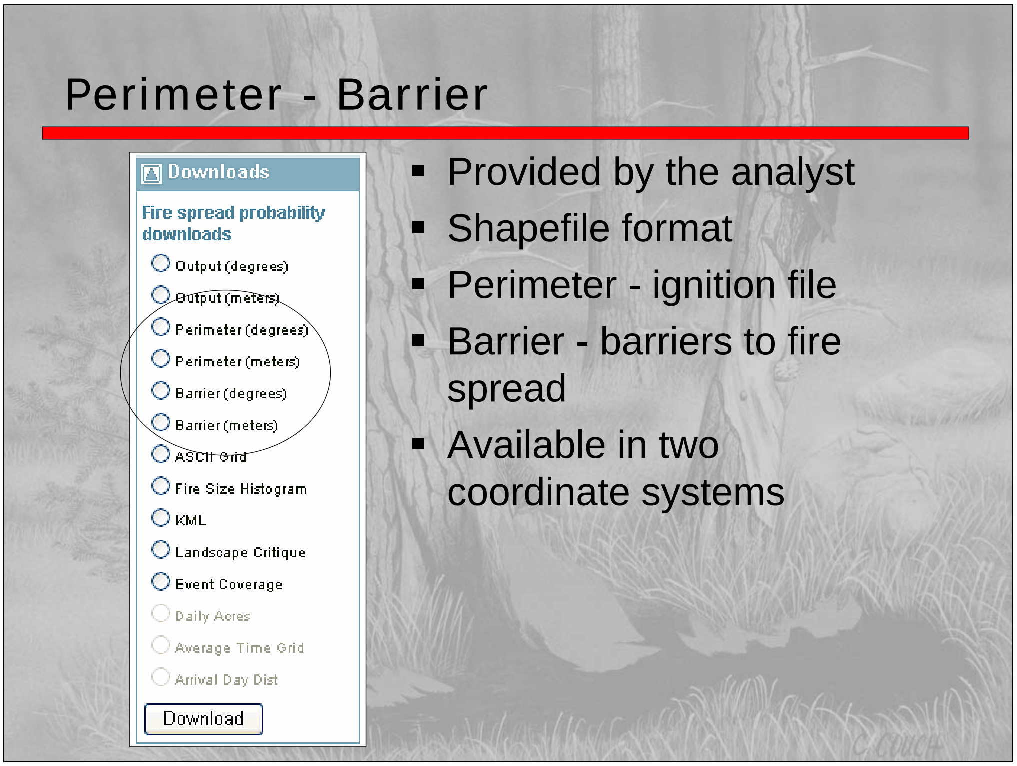
2	Polygon	40	60424	3	4101.039092
4	Polygon	60	60424	5	1817.483654
6	Polygon	80	60424	7	9129.675372

The GRIDCODE values translate to the discrete FSPro probability zones as presented on this slide. If an FSPro run does not encounter a probability zone, its corresponding GRIDCODE will not be in the attribute table. For example, if an FSPro run does not have any less than 0.2% probabilities, the GRIDCODE 0 item will not be present in the attribute table.

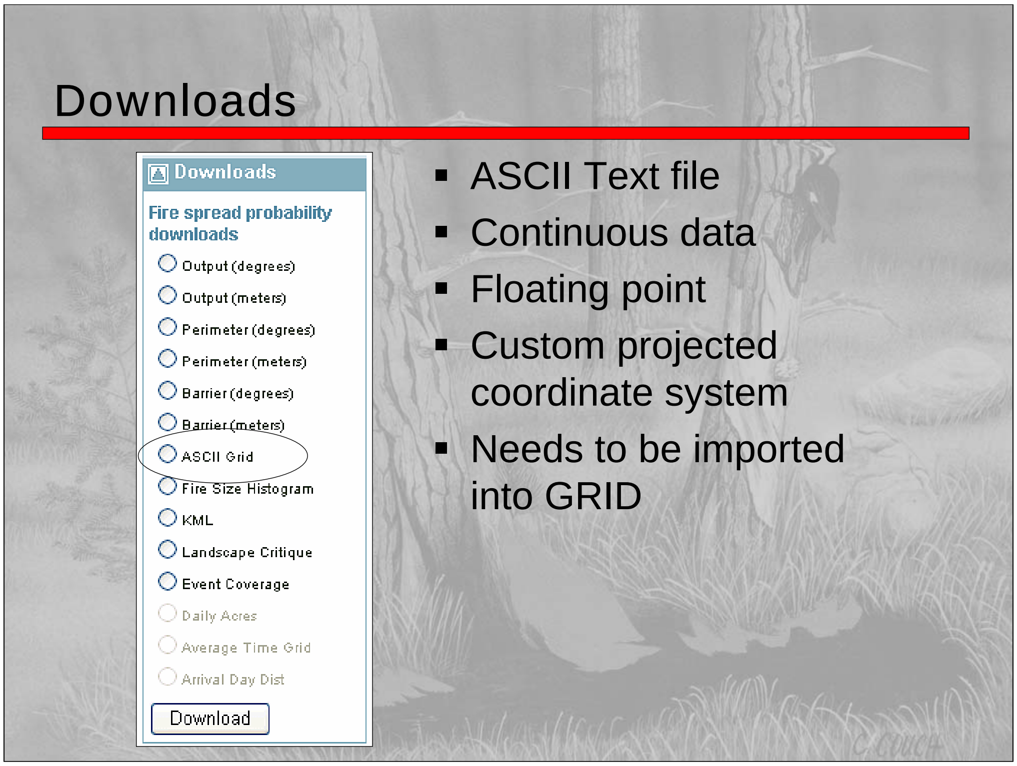


The Perimeter and Barrier files are not outputs generated from an FSPro analysis. Rather, they are information provided by the analyst and used by the model during the simulation. Both are available for download in shapefile format.

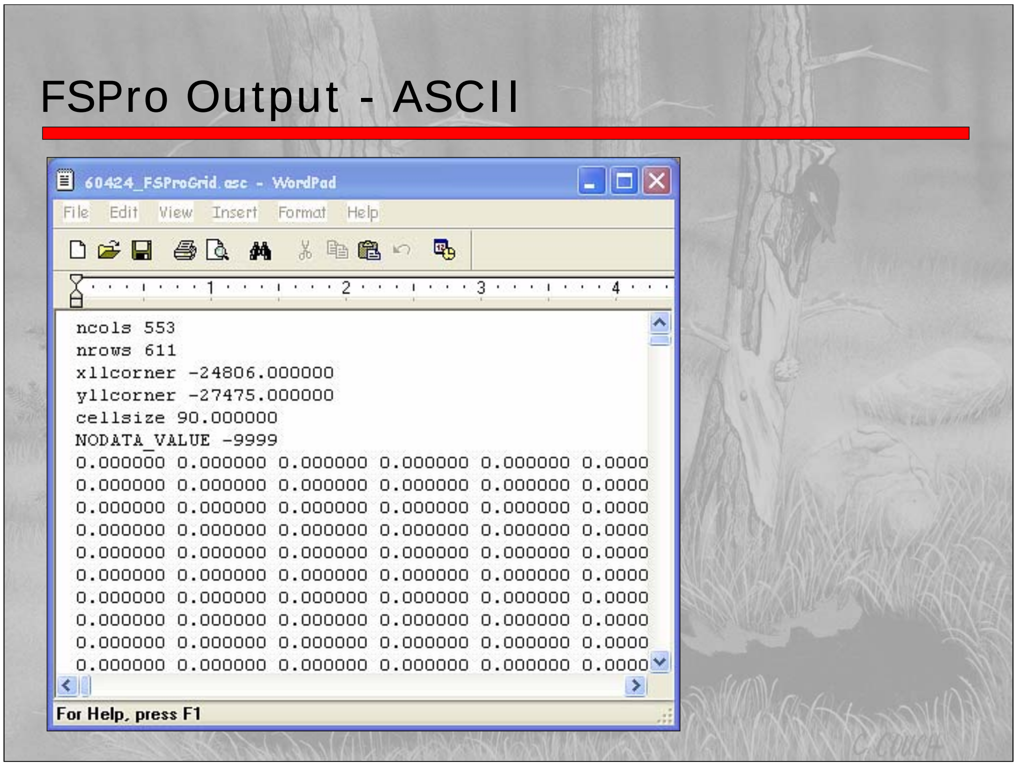
The Perimeter file, is the information that was used as the ignition source for the FSPro simulation. This file can represent a point, line, or polygon feature. The original shapefile used by FSPro could have been provided to the WFDSS system by two methods. The analyst could have uploaded a zipped shapefile created externally via GIS, or the analyst could have developed the file using the mapping tools within the WFDSS system.

The Barrier file is the information that was used to represent any barriers to surface fire spread during the FSPro simulation. This file can represent a line or polygon features, such as roads, streams, previous fires, or completed fireline. The original shapefile used by FSPro could have been provided to the WFDSS system by two methods. The analyst could have uploaded a zipped shapefile created externally via GIS, or the analyst could have developed the file using the mapping tools within the WFDSS system.

The Perimeter and Barrier files can be downloaded in the two different coordinate systems we discussed earlier. A word of caution here. Because the analyst can develop perimeter and barrier files external to the WFDSS system, the coordinate system information for the files downloaded from WFDSS may be different from the original zipped perimeter and barrier files provided by the analyst.

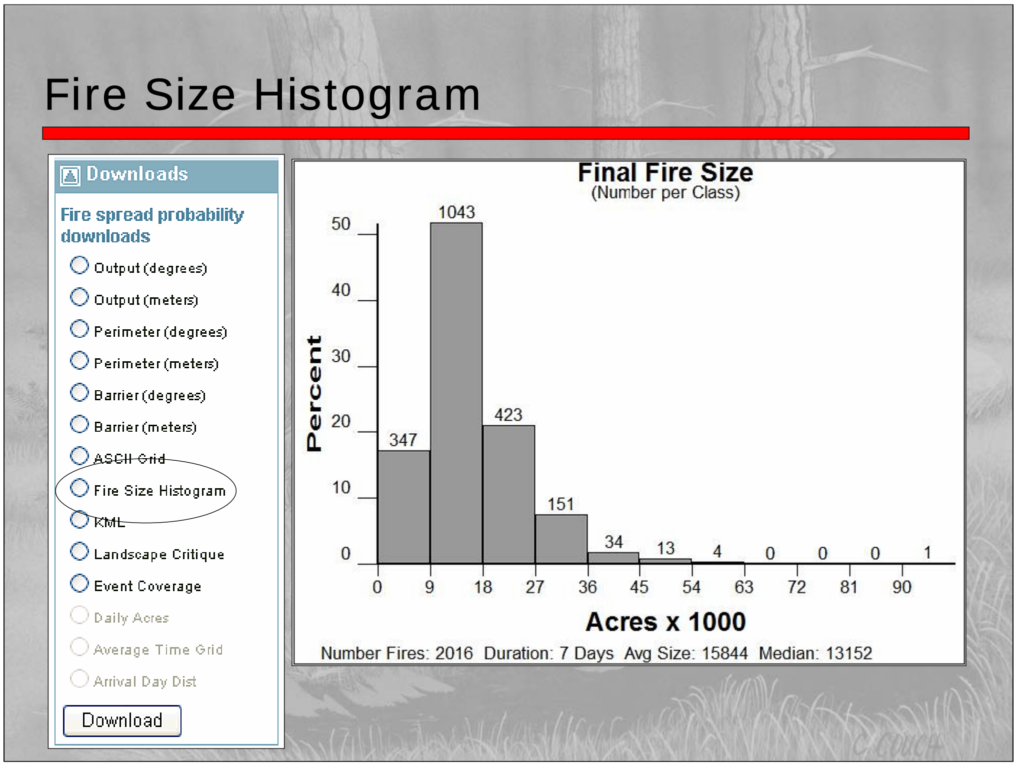


The ASCII GRID is simply a text file output of the FSPro probabilities. The data are in raw form as continuous data with floating point values. This information is reclassified into the seven discrete probability zones represented in the Output shapefile and KML. The provided coordinate system is a custom Albers coordinate system with the spatial units in meters. This information is best viewed in ArcMap by converting it into the appropriate GRID format prior to use.

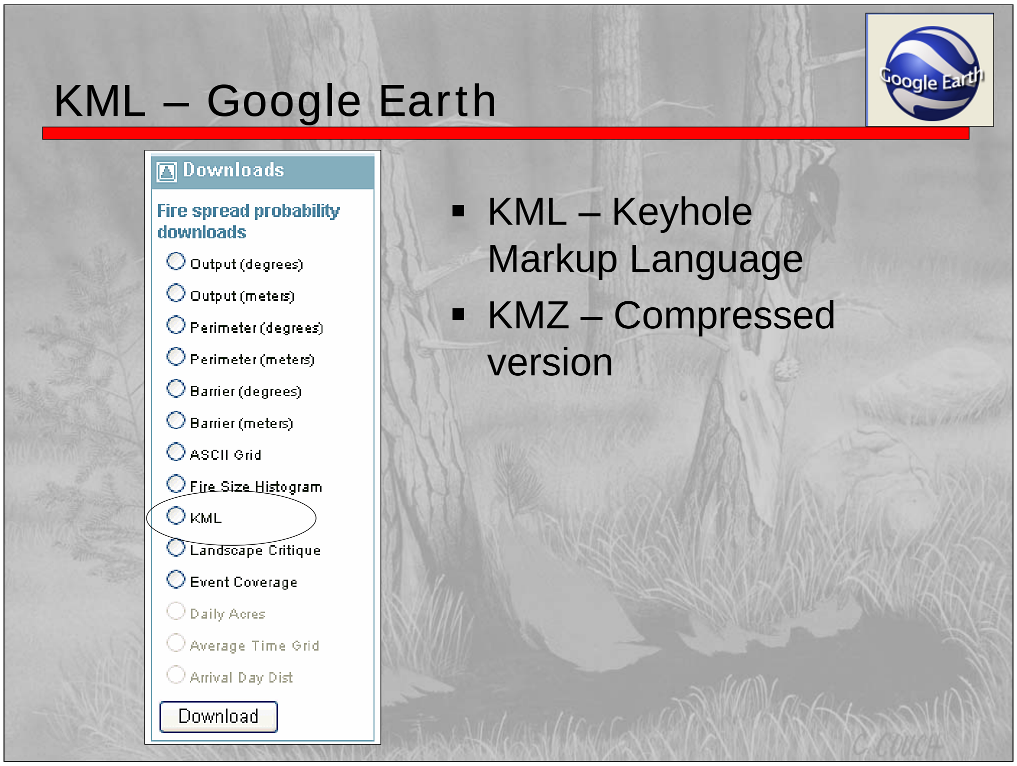


This slide shows an example of the ASCII Text output. In this image, we can see the header information that displays the number of rows (nrows) and columns (ncols), starting coordinates (xllcornor, yllcornor), output cellsize (90 meters), and NODATA VALUE (-9999). In the field corresponding to the file, we can see the values. In this view, they are all zeros (0.000000) in decimal format. If we were able to scroll through the example provided here, we would see that there are values in the file other than zero and that they, too, include a decimal point. The decimal display is an indication they are in a floating point format.

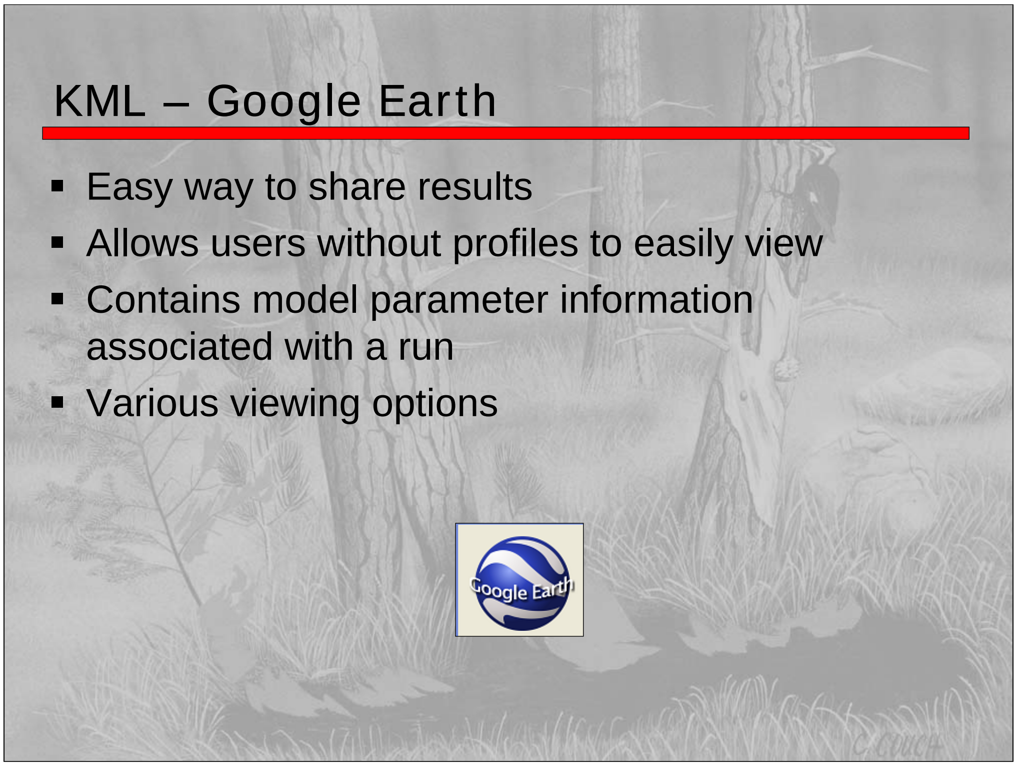
Because these data are floating point, when creating a GRID of these data, it is important to specify that the output data type is floating point or float and not integer. Failure to do this will produce a GRID of all zeros because all the input values will be truncated.



The Fire Size Histogram is identical to what we discussed earlier in the lesson. When downloaded, it is in a JPEG format. In this graphical format, it can easily be inserted into a Word document, Power Point presentation or other presentation materials.

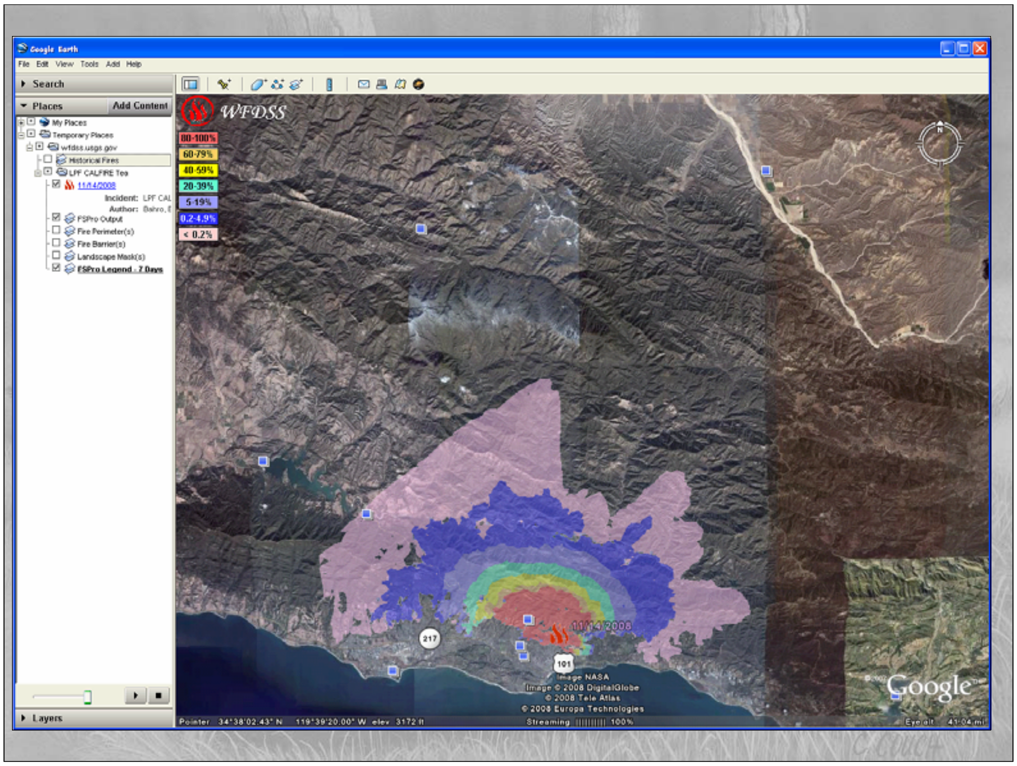


FSPro output is also available as a Google Earth KML file. KML is the acronym for Keyhole Markup Language and, along with a KMZ – which is a compressed or zipped version of a KML file – are the native file formats for Google Earth. The KML version of the FSPro modeling results contains some FSPro model settings and additional output information available for display in Google Earth. The file is viewable in the freeware version of Google Earth and Google Earth Professional.



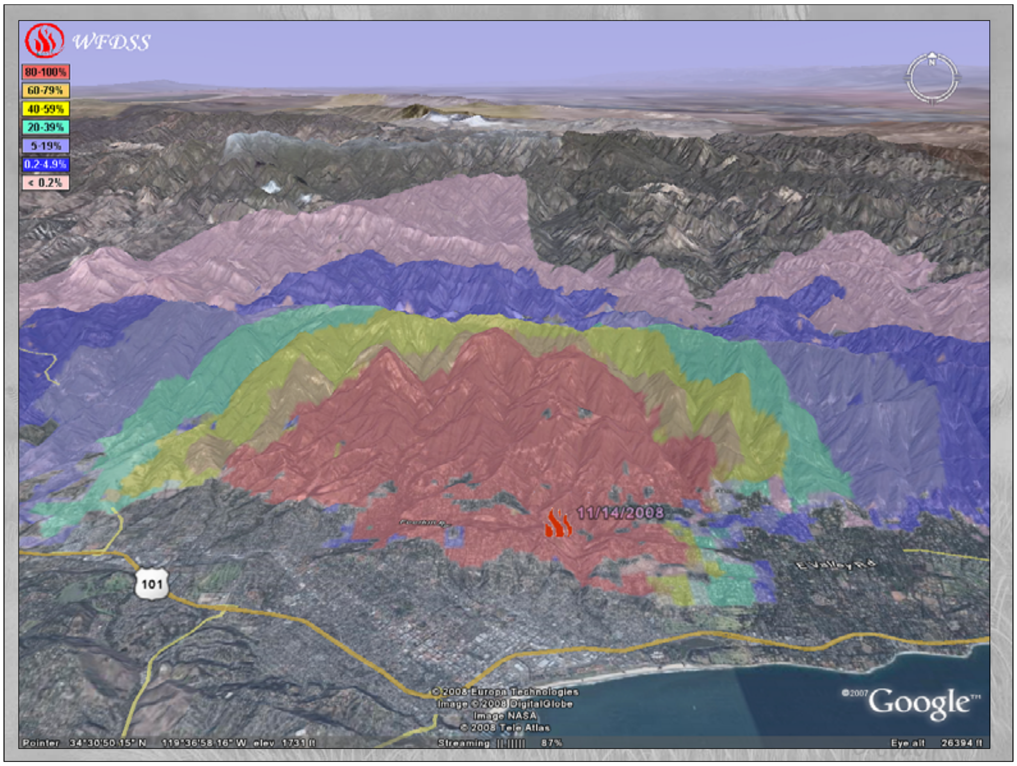
Because the file sizes are relatively small, they can be emailed and easily viewed within Google Earth. Secondly, they are a viable option for sharing modeling results, especially with others who do not have a user profile in the WFDSS system. In addition, these files contain model parameter information associated with the FSPro simulation and summaries of some model results.

The following series of slides demonstrates options for viewing the KML file and several ways to use or display the information within Google Earth. All of the following examples were created in the freeware version of Google Earth.

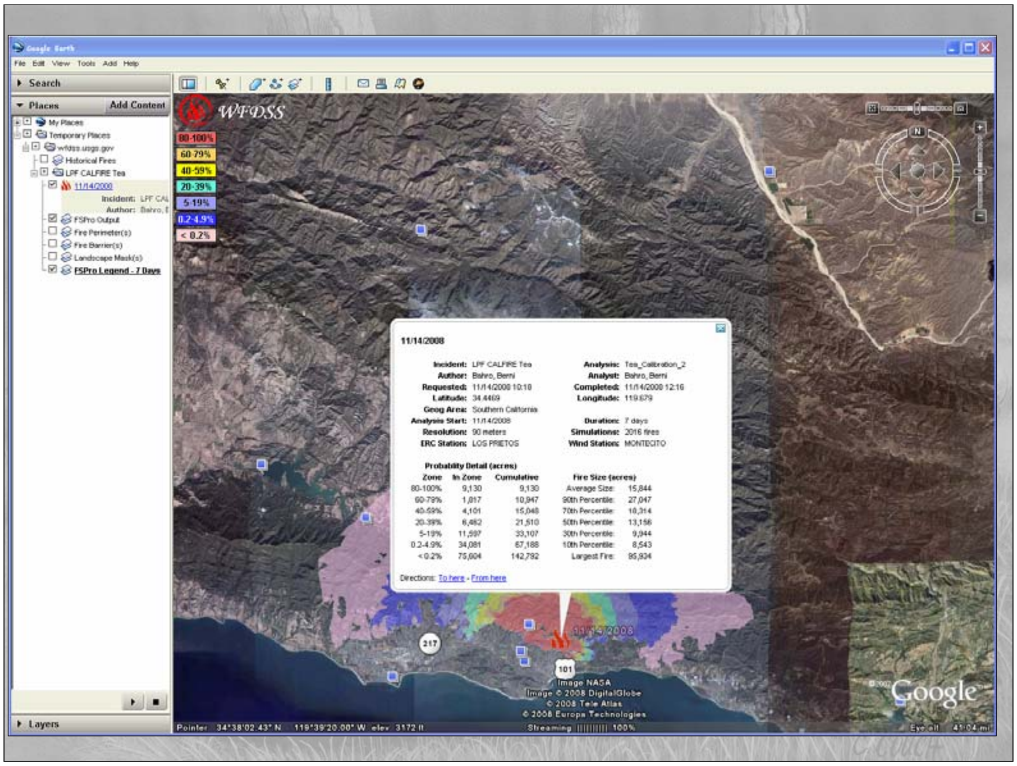


Here is a standard view of the FSPro KML in Google Earth. In the main part of the view, you can see the FSPro probability zones displayed along with the Probability Zone Legend in the upper left corner. In the interior of the displayed probability zones, there is a Red Flame icon; the icon location is tied to the incident latitude and longitude when the incident was created in WFDSS. The associated date is the entered incident start date in the WFDSS system.

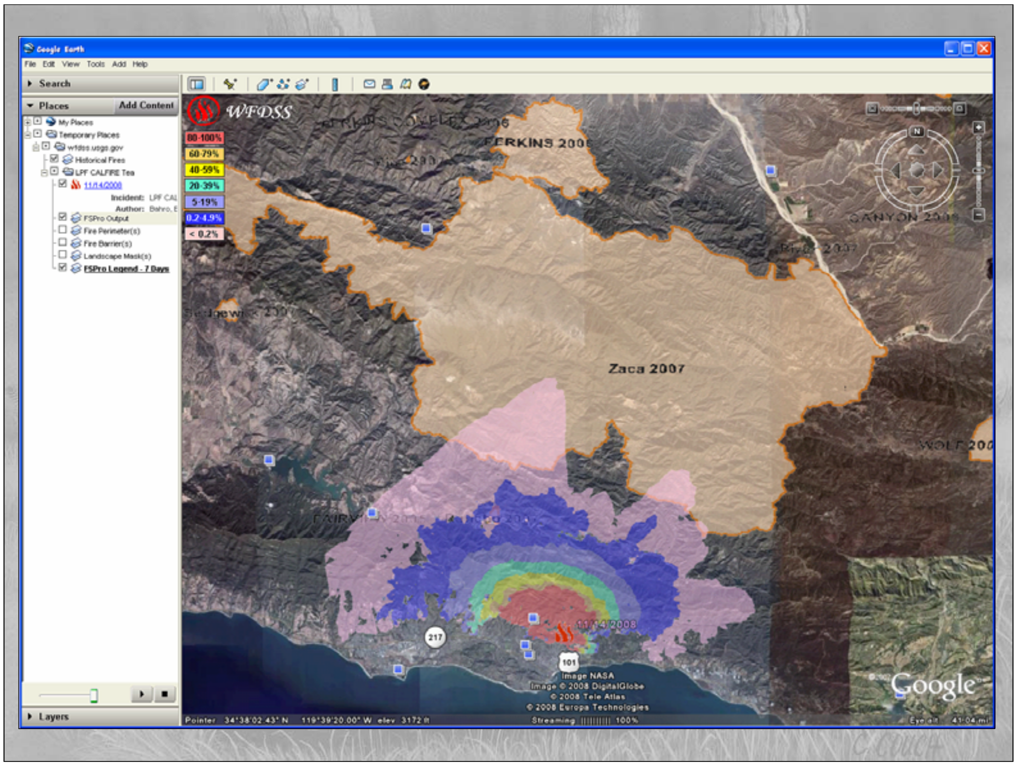
In the menu tree on the left side, all the other available data for viewing is visible. In this example, every item has been expanded. Any item can be turned-on or off by checking or un-checking the box next to the item name. Other data that can be added for viewing in Google Earth are as follows: 1) Historical Fires – This is a limited nationwide coverage of past fire perimeters covering the period from 2001 to 2007 and greater-than or equal-to 300 acres. The coverage of historical fires is not complete, however. As such, there are fires in some local areas that will be missing; 2) FSPro Output – This is the discrete probability zones shown in the main view; 3) Fire Perimeter(s) – This is the ignition perimeter used in the simulation; 4) Fire Barrier(s) – This constitutes any barrier files used in the simulation; 5) Landscape Mask(s) – This is any landscape mask used in the simulation to alter or edit the landscape file; and 5) FSPro Legend: 7 Days – This corresponds to the legend displayed in the upper left corner. The number of days in the legend name will change based on the respective FSPro simulation duration.



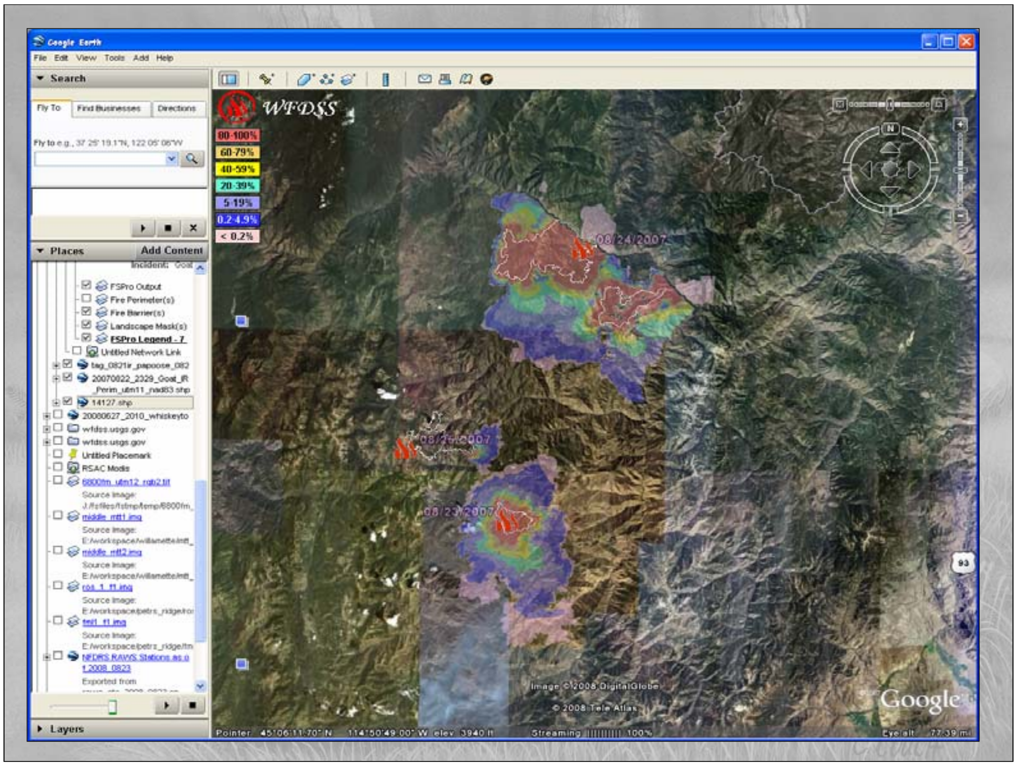
The flexibility of the KML file lies in the ability to zoom in and alter the perspective of view from planimetric to 3-D. Google Earth is a very powerful display tool. If you are not familiar with it, we encourage you to explore the use of Google Earth.



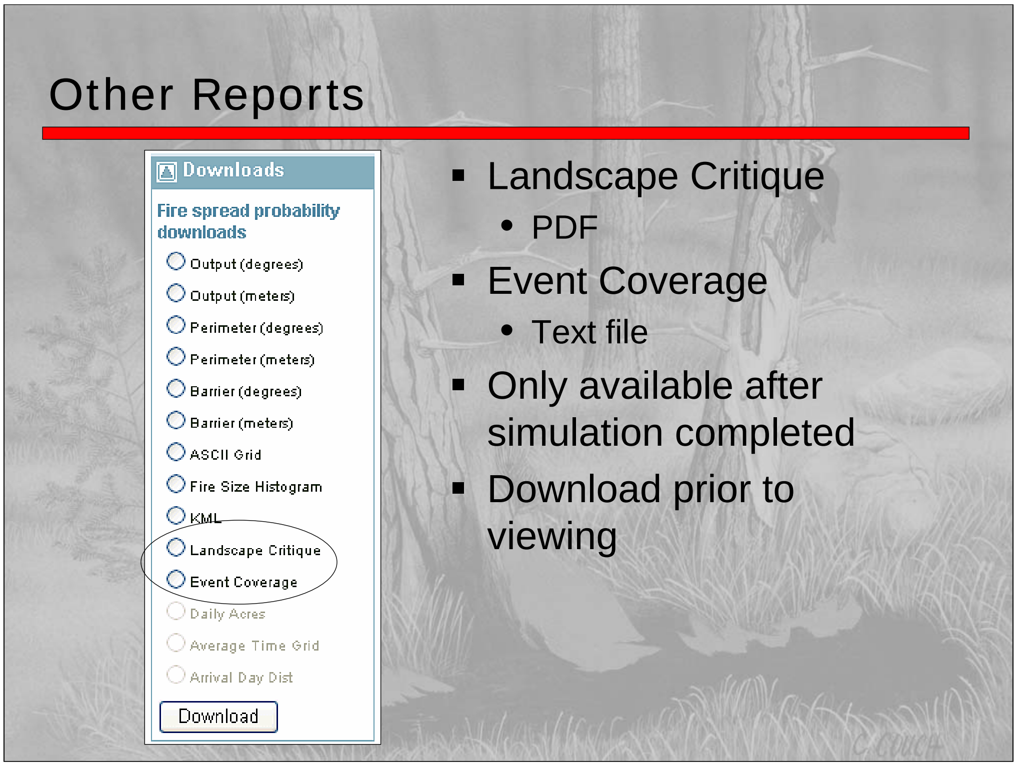
By clicking on the Flame icon in the view, a pop-up box will open. It contains some basic information about the incident and model settings. Additional information about the modeled Fire Size Distributions (discussed earlier in the lesson) and the acres by discrete probability zone are also displayed.



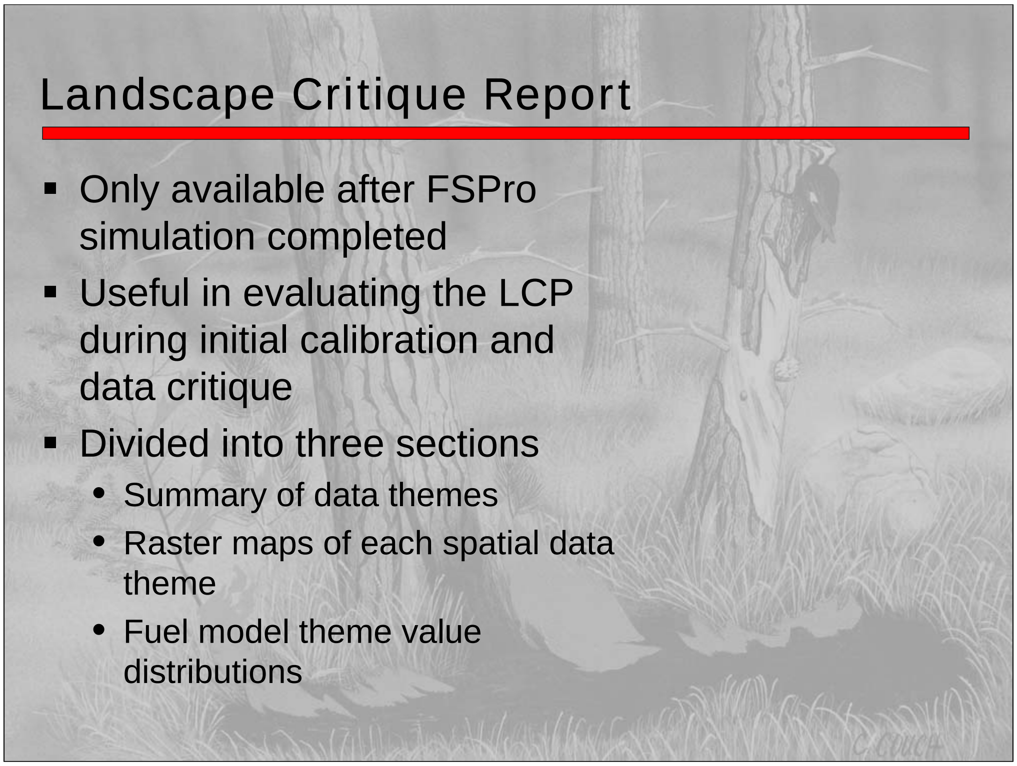
In this example, the Historical Fires layer has been activated. In this close-up view of the FSPro output, we can see two large fires: the 2007 Zaca fire and, further north, the 2006 Perkins fire. Note that no other information regarding these past fires is available within Google Earth. Remember the general location of the Zaca fire in relation to the FSPro output. In a later part of the lesson we will mention the Zaca fire again.



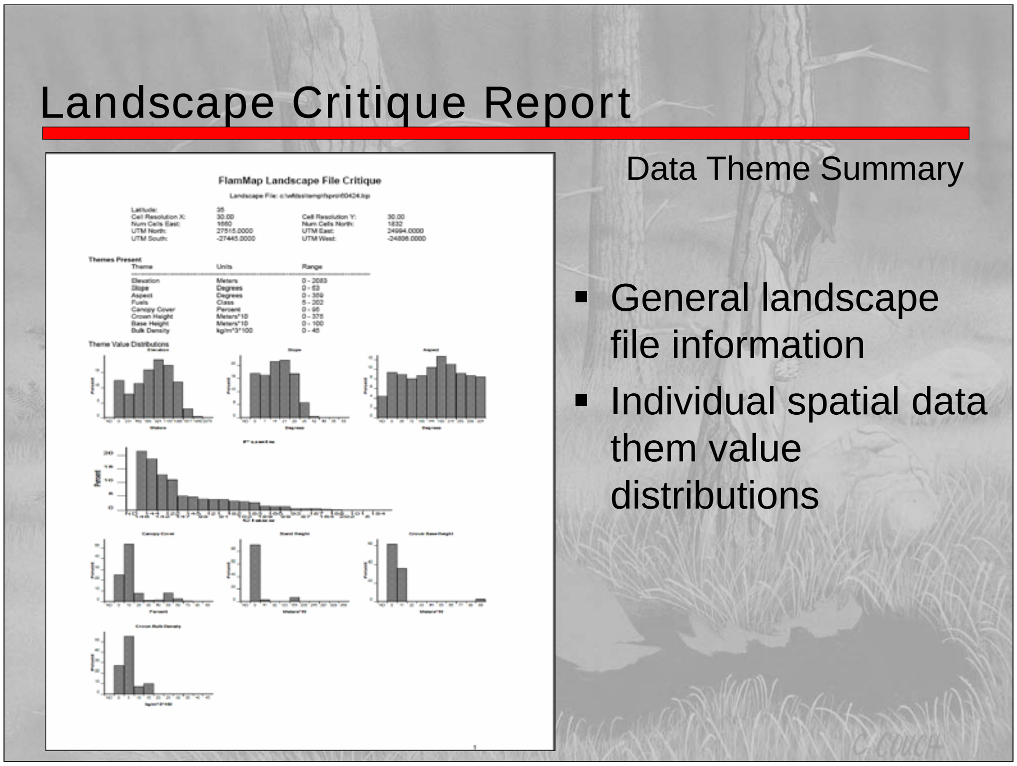
In this example, KML output from several FSPro runs has been loaded into Google Earth. Here, several fires from the Payette National Forest in 2007 are being displayed, and so we can see the potential for these fires to merge together. Looking at each FSPro run individually, the potential interaction between fires is not as readily interpreted. But in a view such as this, we can start to get a feel for the landscape-level nature of these fires. Looking at complexes or a group of individual fires' FSPro output is a good way to explore these possibilities. Within Google Earth, we can load multiple fires and zoom and fly around the area, looking at fires from different directions and perspectives. In planning meetings, displaying the data in this manner can be very beneficial in facilitating discussions about how to manage these events and look at them strategically.



The Landscape Critique and Event Coverage are available only after the simulation is completed and are best viewed after being downloaded. The Landscape Critique file is in a PDF format the Event Coverage is in a generic text file format.

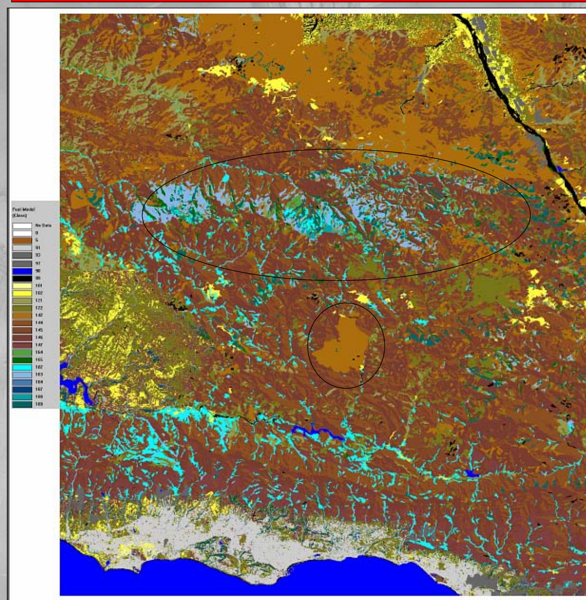


The Landscape Critique Report is available only after the FSPro simulation has completed. The report itself is useful to the analyst in critiquing the landscape (LCP) and investigating issues related to the data. During the initial calibration and critiquing of FSPro simulations and the associated landscape data, it is recommended the analyst review this information. The Landscape Critique report can be many pages long and is divided into three basic sections: a general summary of data themes present, raster maps of each spatial data theme, and fuel model theme value distributions.



The first section of the report, displayed here, offers a description of the landscape (LCP) file parameters such as cell size and latitude, a summary of the data themes present in the LCP and their respective data ranges and units, and lastly histograms of each individual data theme. This is a quick way to get a feel for the data in the landscape and whether there are some themes with data values outside of normally expected ranges for the locale. For example, are the ranges of elevation or slope appropriate for the area you are modeling? The histograms can provide insight into the distribution (on a percentage basis) of the dominance of certain data classes. For example, the majority of fuel models for this landscape are in the grass-shrub and shrub fuel types (approximately 77%).

Landscape Critique Report



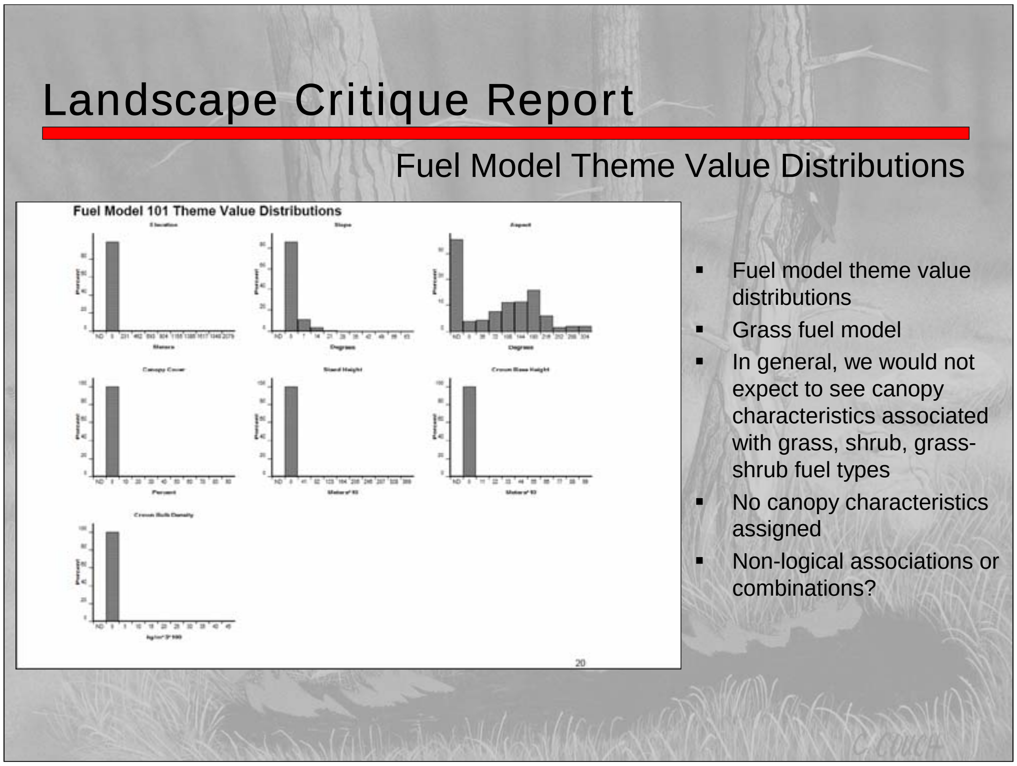
Raster Themes

- Raster maps of all present data themes
- Includes a legend
- Cannot query the layers
- Provides a quick look at the themes
- Look for spatial patterns or anomalies
- Other data viewing and querying options exist that may provide more context

Although raster maps of all the spatial data themes are available in the report, they are not available in any other format and they can not be queried or examined. Their main purpose is to provide a quick glimpse of the data layers. Due to their size, it is likely that only major problems or anomalies with the data will be visible. Other viewing and querying options, discussed in Lesson 1 of this unit, offer ways to more thoroughly investigate the data.

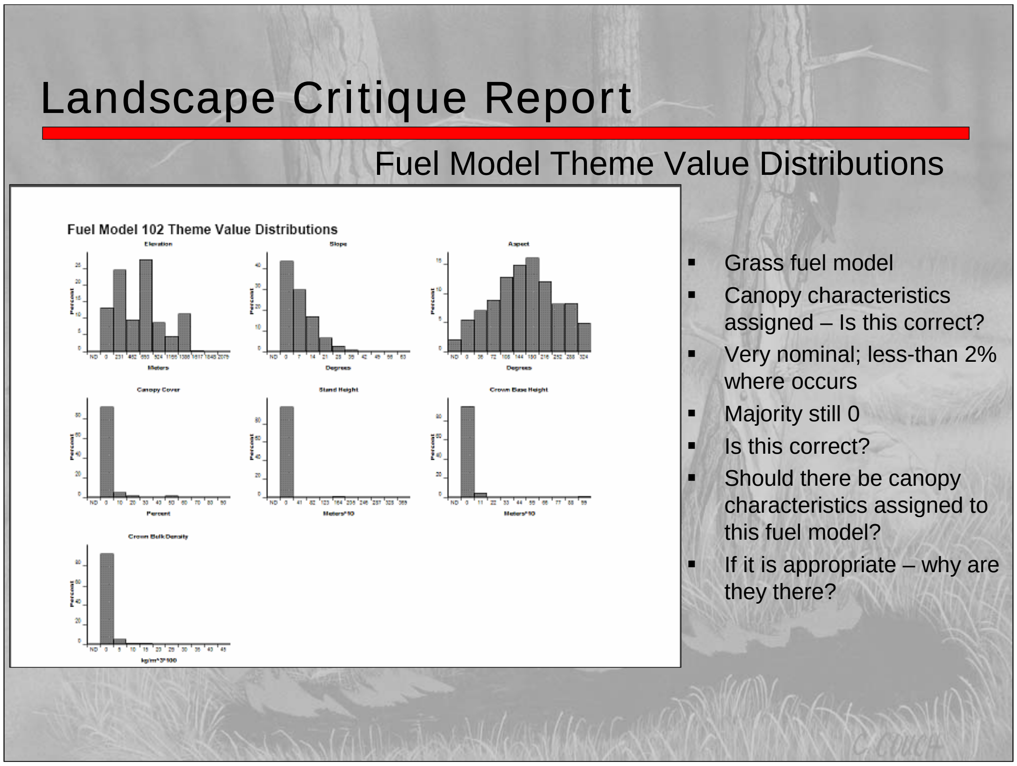
However, looking at the example here, which is the fuels layer, several items do jump out. First, the light brown patch in the middle (in the white circle) looks like a possible past fire, which, in this case, it is. This area is the Ogilvy fire, which occurred in 1998. If you remember the previous slides we looked at, this fire was not visible in the view of historical fires, it showed the Zaca fire burning around this area. Therefore, in this case, we would want to follow-up on why that is. Although the legend here is difficult to read, the fire area is classified as a fuel model 142, which is a moderate load, dry-climate shrub fuel type. Is this correct given the time since fire (11 years) for the local area? Knowing that the fuels in the area are classified as fuel model 142, we can then examine the relationship of this fuel type to the other data attributes later on in the report Secondly, what about the Zaca Fire from 2007? The black circle on this slide depicts the general area where the Zaca Fire occurred. It really dominated the landscape. Does it appear that the fuels represent the changes associated with this more recent (one year old) fire? Another item to investigate further.

The take-home point here is that its important to look at the data for odd spatial patterns as these may indicate issues with the data. In a real-world modeling exercise, you would want to follow-up and talk to someone familiar with the data development. Find out why certain fuel models were assigned and determine if they are represented appropriately in the data you are using. It is imperative to investigate the data in the context of the area you are working in, which you may not always be familiar with.



The last section of the report has a series of histograms by fuel model theme. Because the histograms show the distribution of the other data themes, they are useful for quickly checking for illogical or quirky associations of the other data themes within the respective fuel model. In the example here, we are looking at fuel model 101, which is a short, sparse dry-climate grass. Think sparse discontinuous fuels, low level fuel loads, and grazed. Given this is a grass fuel model, we would expect the data themes containing information on canopy characteristics to be zero where coincident with this particular fuel model. Reviewing the histograms here support this case.

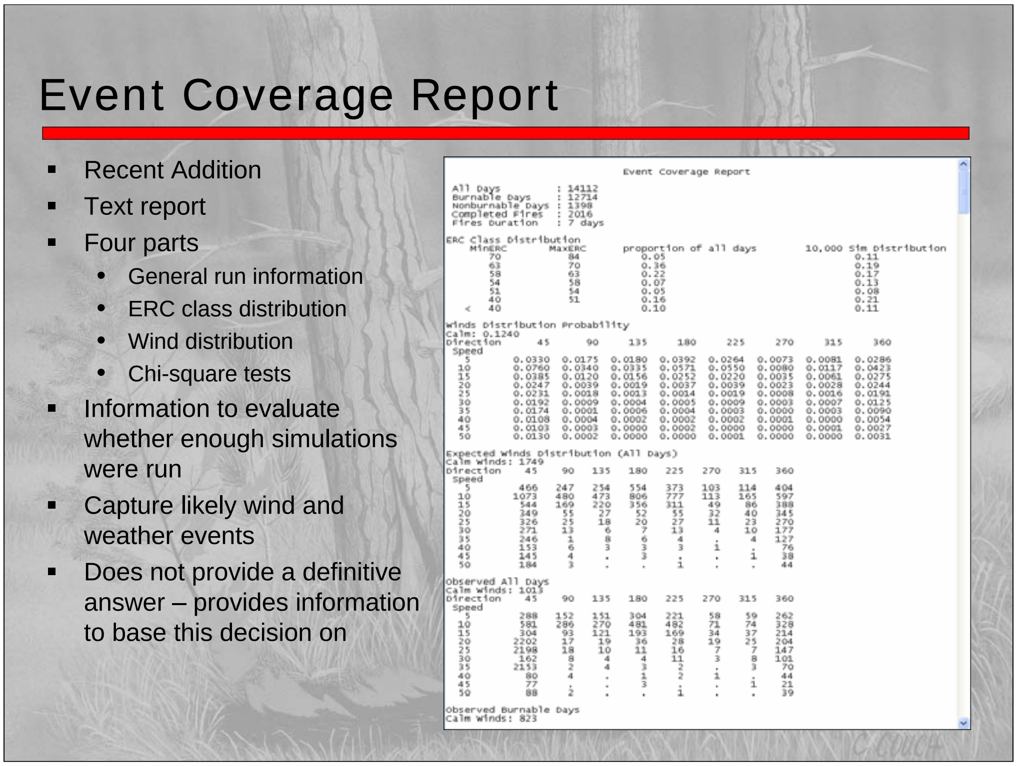
In general, we would expect grass, grass-shrub, and shrub fuel models to not have canopy characteristics assigned to them; however, there are always exceptions. All of the canopy characteristic themes associated with this fuel model (canopy cover, stand height, crown base height, and crown bulk density) meet this general case; they are all set to 0.



Here we have another example. This time we are looking at fuel model 102, which is defined as a low load, dry-climate grass. In this example, however, there are some canopy characteristics associated with this data theme. Is this incorrect or is it okay?

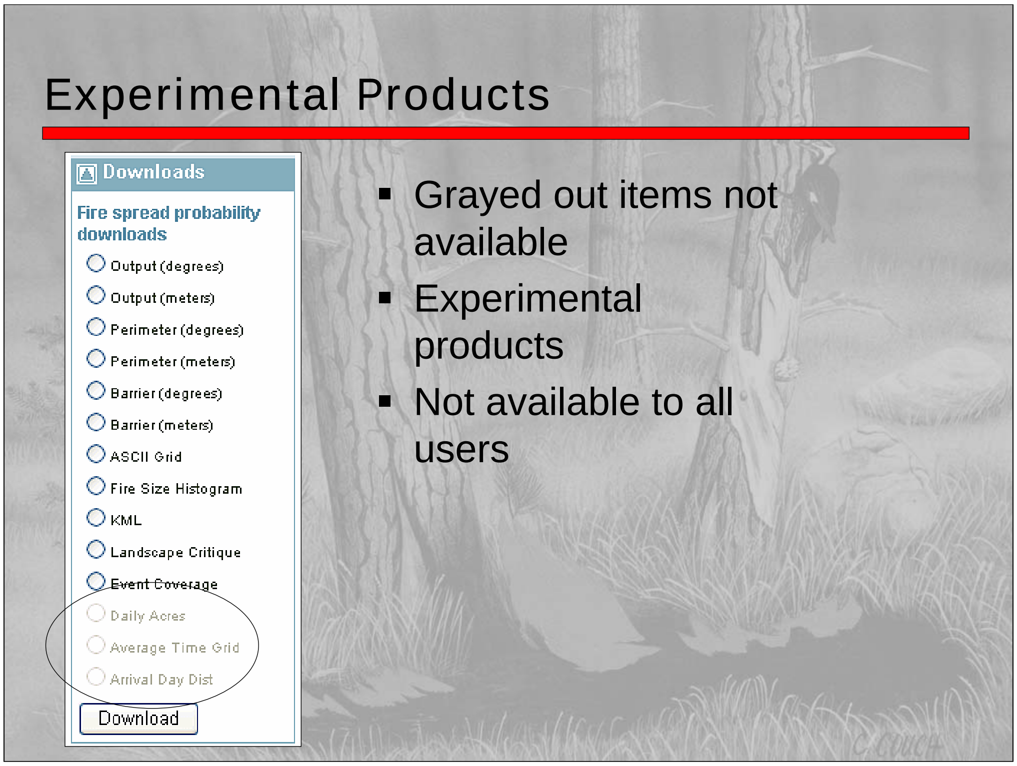
Looking at the histograms for the vast majority of the landscape where this fuel model occurs, canopy characteristics are set to zero. Where canopy characteristics are assigned, they represent a very low proportion of the total landscape. Canopy characteristics seem to occur in isolated or unique situations. It could also be the result of a logic error in the assignment of these data themes during data development.

In this example, having local knowledge of how the fuels layer was developed or access to the metadata associated with the data development would be helpful. Here the landscape data is from the California Statewide data set. In this instance, the inclusion of canopy characteristics was planned. The intent was to capture a scattered oak overstory with a grass understory. So in this example, the inclusion of canopy characteristics over the grass fuel model was by design. However, it is always good practice to follow-up on these occurrences to confirm the assignments were intentional and that recent disturbance changes have not altered these areas requiring further modifications.

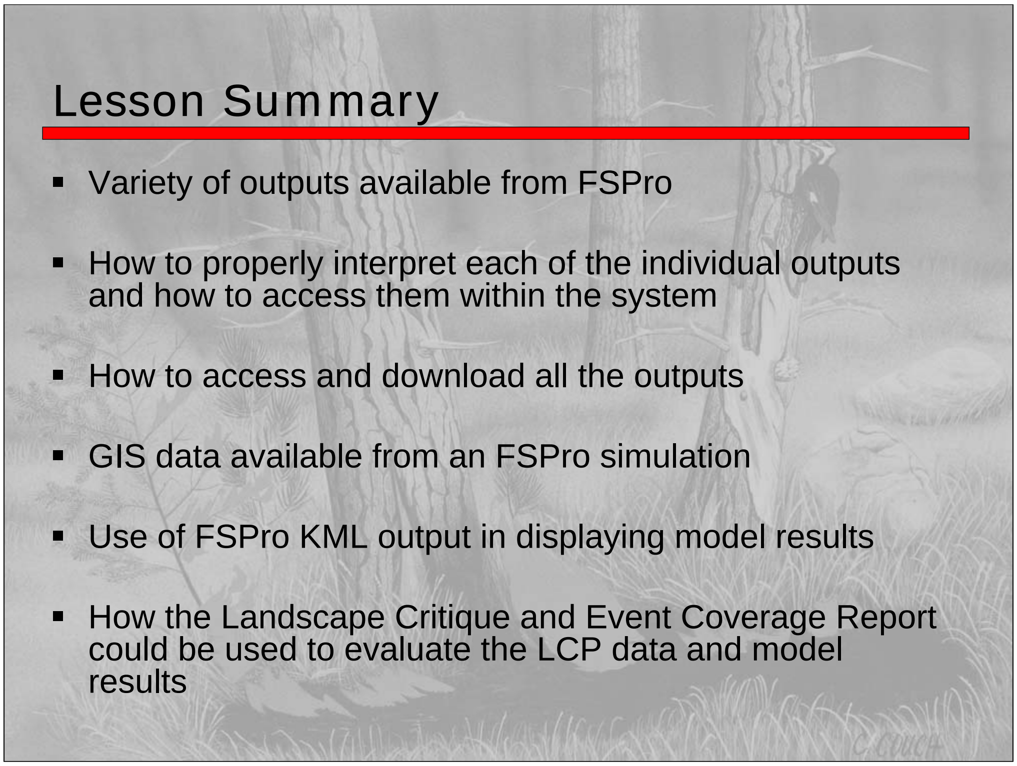


The Event Coverage report is a relatively recent addition, and thus the use and interpretation are still being finalized and developed. The report consists of four parts: General Run Information, ERC Class Distribution, Winds Distributions, and Chi-Square tests. The main purpose of the FSPro Event Coverage report is to tell the analyst that an FSPro analysis has simulated enough fires to capture the likely weather and wind events. This includes the rare events that are responsible for the < 0.2% areas on the FSPro Probability output. The report can also highlight any bias towards any given weather or wind scenarios encountered during an FSPro run. The information provided in this report can be used to ensure that the estimated burn probabilities are as close to real as possible, given the number of simulated fires and other information provided to the model.

The analyst should consider or focus on three areas of the output briefly discussed here. First, examine the ERC Class Distribution. Are the proportion of all days in the simulation close to the 10,000 simulation distribution? Secondly, look for the occurrence of high-speed wind events. Were any high wind speed days selected? How many? Lastly, evaluate the Chi-Square statistics comparing burnable days and the higher ERC Classes to their corresponding winds distributions. Are the P-Values all 0.001 or greater? This is one case in which you do not want low p-values. The larger the p-value, the more likely it is that the observed winds distribution is in line with the expected winds distribution. If you can answer yes to these questions, you most likely have enough simulations.



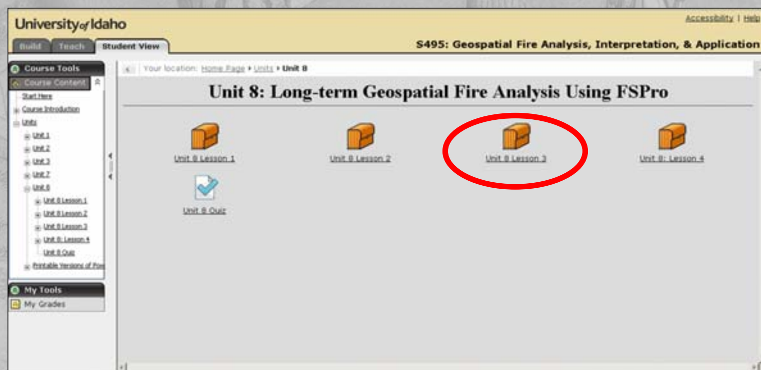
Lastly, there are some experimental products that are not yet available to general users. These items (Daily Acres, Average Time Grid, and Arrival Day Dist) should always appear as grayed out. The use and interpretation of these products are still being researched at this time.



Following are the major points that were covered in this lesson: First, we discussed the variety of outputs available from FSPro. We then discussed how to properly interpret each of the individual outputs and how to access them within the system. We covered how to access and download all the outputs and provided insight into the GIS data available from a FSPro simulation. We demonstrated the use of FSPro KML output. And lastly, we demonstrated how the Landscape Critique and Event Coverage Report could be used to evaluate the LCP data and model results.

What’s next?

Please now proceed to Unit 8 Lesson 3…



You’ve reached the end of this lesson. Please now proceed to Unit 8 Lesson 3: FSPro Interpretation and Application…